ELECTRICAL REVIEW

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Coal Nationalisation

The Electrical Industry's Position

REORGANISATION of the coal industry interests the electrical industry for three main reasons. The supply branch is an important customer of the collieries; the collieries are important customers of the electrical manufacturers; and methods proposed in the acquisition and operation of the mines may give some indication of what will happen with regard to electricity.

If reorganisation is likely to result in cheaper coal of a more consistent quality the electricity supply industry cannot but approve. It is stated in Clause 1 of the Coal Industry Nationalisation Bill that one of the duties of the proposed National Coal Board is "making supplies of coal available in such quantities and at such prices as may seem to them best calculated to further the public interest." There is no reference to quality. It may be mentioned that in the second reading debate on the Bill last week Mr. Foster, Parliamentary Secretary to the Ministry of Fuel and Power, said that whether "the people" got more and cheaper coal under nationalisation was not the only test. The Government's primary consideration was the social and economic welfare of the miners and their families.

Equipment for Modernisation

If the provision of £150 million for the modernisation of the mines is contingent upon nationalisation the electrical manufacturers, who must provide a substantial part of the new equipment, may not be antagonistic to the Bill, although they may not approve its general principles.

As to the third aspect : are any indications to be gathered from last week's debate of the possible course of action in the case of the electricity supply industry? It is necessary to examine the reasons put forward by the Minister of Fuel and Power for the necessity of the measure now before Parliament and compare the history and present conditions thus surveyed with those which have prevailed and now exist in the electricity supply industry.

Output Contrast

Mr. Shinwell pointed to the fall in output from 267 million tons in 1924 to 174 million tons in 1945 in spite of the desperate need for more coal. Against this reduction of 31 per cent. may be set the rise of 400 per cent. in the output of electricity in the same period. The Minister said that this reduction had a profound bearing on the price of coal, reduced our capacity for export, inspired unrest and created confusion in the public mind. As our readers know, the price of electricity (apart from the comparatively small wartime increases) has continued to fall with the rising output which has aided manufacturers and has inspired public confidence in electricity supply.

Conditions in the mines have been such as to cause constant labour trouble and a reduction in the number of men employed from 1,172,000 in 1924 to 694,000 in 1945 (the war was responsible for only a part of this). Employment in the electricity supply industry has continued to grow and labour disputes have been small and infrequent. Mr. Shinwell said that only the State could take the risk of opening up

remaining coal resources which lay very deep. The electricity supply industry is constantly opening up new areas without any form of State assistance; it bears the risks itself. It thus appears that the arguments put forward to show the necessity for nationalising the coal industry may reasonably be regarded as wholly inapplicable to electricity supply.

Ministers and Boards

IT was left to Mr. Herbert Morrison in winding up the debate to make the only significant reference to electricity. He said that " it may be that when we come to electricity, or gas, or transport, or—if we do—iron and steel, that other structures will be necessary." Mr. Morrison also sought to show that there would not necessarily be Ministerial interference with the operation of the National Coal Board, referring, as a parallel, to his happy experiences with Sir Andrew Duncan who was chairman of the Central Electricity Board when he was Minister of Transport. It is by no means certain that this excellent precedent will be followed and once again we ask the Government to consider very carefully before they start reorganising an industry which is already serving the public well.

Reorganisation Conference

AN official summary of proceedings issued just after a conference held in December between the Minister of Fuel and Power and the electricity supply organisations was rather too summary for it missed out the main point. It gave the impression that all the Minister wanted was an assurance that development would proceed in spite of impending reorganisation, whereas the most important outcome was a suggestion by the Minister that a joint committee should be set up to discuss details of the proposed Bill with officials of the Department. The subject of voltage standardisation was also referred to at the conference.

Export Expansion

IN a statement on production for export last week, Sir Stafford Cripps, President of the Board of Trade, said that export orders for heavy electrical plant valued at £414,000 were approved during December. Sir Stafford did less than justice to the contribution which the industry is making towards the expansion of export trade, for we are authoritatively assured that the total was about £220,000 greater than this. The discrepancy may be explained by the fact that Sir Stafford's figure excluded plant coming under the Control of Industrial Electrical Equipment Orders. The December total represents on an annual basis about £7,656,000 which compares with the total of about £8,700,000 in 1938, which was a record year. (We should stress the fact that exports of electrical goods and apparatus are not taken into account in these figures.) Alterations in value have to be considered and if the increase is put at 50 per cent., which is reasonably accurate for a rough comparison, the volume of production is at about 59 per cent. of the 1938 level. According to Sir Stafford Cripps the monthly volume of November-December exports in general was half the 1938 monthly average.

Purchase Tax Remissions

RECENTLY Mr. V. W. Dale, general manager and secretary of E.D.A., wrote to the Commissioners of Customs & Excise with regard to the purchase tax on heat-insulating jackets for domestic hot-water cylinders. The Commissioners have replied to the effect that these jackets do not come within the scope of the remission of the tax on water-heating equipment made last October. They no doubt have their reasons, but that is not what we wish to discuss at the moment. Their letter went on to say: " Your representations have, however, been noted for consideration with the review of cases for remission or abatement of tax which will precede the next Budget." It is good to know that such a review is in progress. There are several electrical appliances which might logically have been included in last October's remission and we hope that these are receiving consideration.

Due Notice

THE Budget will be presented early in April so that less than two months remains. Appeals have been made by traders for due notice to be given when alterations in purchase tax are contemplated. This has been done in some cases; last week for instance notice was given of the proposed removal of the tax on organ blowers. How much more important it is that those concerned should be notified before changes are made in respect of such widely used appliances as electric kettles, irons and toasters.

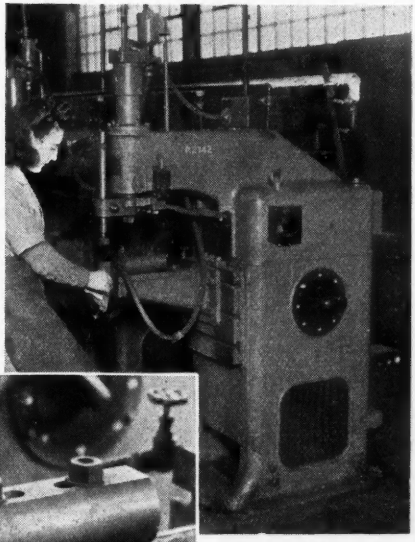
Mass-Production Welding

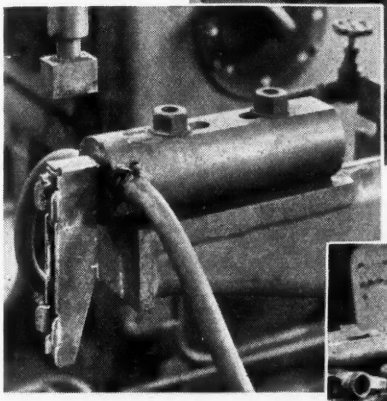
Processes in the Manufacture of the Sten Gun

IN the *Electrical Review* of January 18th last we published an illustrated description of the electrical applications in the manufacture of rifles, based upon a recent visit to a Royal Ordnance Factory by the courtesy of the Ministry of Supply. During this visit we also saw some of the processes involved in the manufacture of the Sten gun, which is to a great extent a product of the welding art.

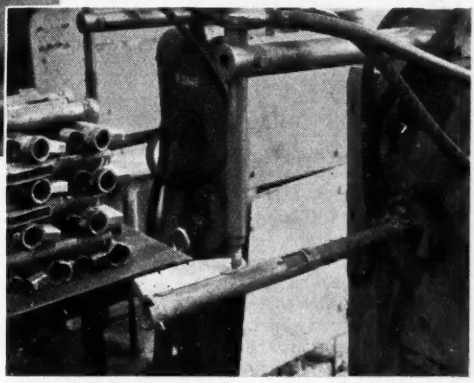
The major components of the Sten gun are the case, barrel, breech-block, trigger mechanism and the butt. The cases are received at the factory in the form of drawn tubes which require various punching and milling operations to prepare them for receiving the other components. After these preliminary operations the head case rear and the trigger-mechanism box are spot welded together in their relative positions on a battery of manually operated single-phase spot welders, each of which has a capacity of 20 kVA and is supplied at 400 V. Each welding machine is fitted with a timing "service," so that the current and welding time can be closely controlled. The electrodes are water-cooled, the water supply being taken from town mains. The components for welding are first assembled together and held in position by special jigs. The operator then simply applies the whole assembly to the electrodes and operates the machine to effect the required welds.

In the trigger-mechanism assembly a plate has to be fixed into one end of a





A plate is fixed into one end of the rectangular trigger-mechanism box by projection welding on 100-kVA machines (above)

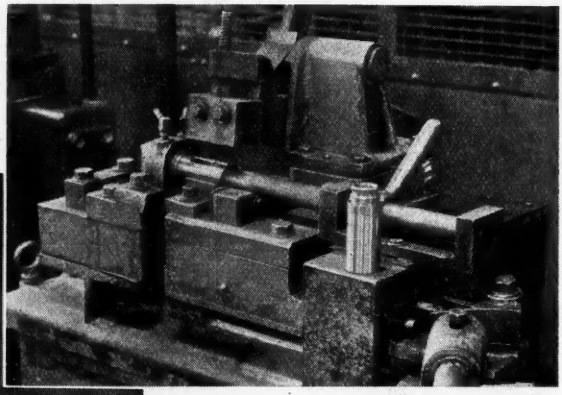


The head case rear and the trigger-mechanism box are spot welded together on manually-operated 20-kVA single-phase welders

rectangular box, and this is effected by means of projection welding. The plate has six protruding " pips " impressed on it in a preliminary operation, and in this condition the plate is placed in position in the box, and the assembly is put on the welding machine so that both the plate and the box end are in the correct position for welding, *i.e.*, between the electrodes, and the current and pressure are then applied. The machine used for this operation is a 100-kVA welder in which compressed air operates on a piston at a pressure of 80 lb. per sq. in. to give the necessary pressure to the electrodes. The timing device governing the actual welding incorporates a " Thyratron," and with this the timing can be set to very close limits, if necessary in cycles. Here again the electrodes are water-cooled to enable them to carry the high currents involved.

The component which actually clamps the barrel to the gun is called the nut barrel, and this is produced from a short length of tube and a circular nut, both of which are butt welded together on a machine of special design which is, in effect, a 20-kVA welder with water-cooled electrodes. The two parts are firmly clamped horizontally to the electrodes and are then brought together by an operating lever fitted with a cut-out switch which is brought into operation immediately after the parts have been welded together and the assembly has assumed a definite finished length. Following this operation the components are passed through a centreless grinder in which the surplus metal around the welded regions is trimmed off.

Arc welding is employed extensively in the manufacture of some of the components, and for these operations there is a bank of suitably equipped welding booths, all supplied with current from English Electric welding transformers and regulators. The transformers are of the multiple-operator type, with inter-star connection to prevent interference between the welding equipments.



The tube and circular nut of the nut barrel are butt welded together on a special 20-kVA machine

Arc welding is employed extensively in the manufacture of components, in suitably equipped booths

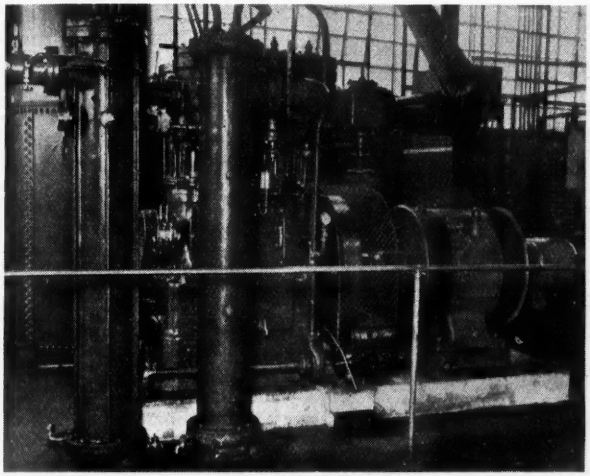
Fume extraction from the booths is effected by a fan mounted above the booths and driven by a 4-HP motor. Low-voltage lighting is provided in the booths to assist the operators in jigging the components before welding.

Air chucks are fitted to most of the lathes in the Sten-gun department, and the air is uspplied by a Browett Lindley two-stage compressor which has a capacity of 500 cu. ft. per min. of free air at 100 lb. per sq. in. and is driven by an English Electric 105-HP slip-ring motor at 1,418 RPM. The motor is controlled by an Allen West contactor panel, the resistance in the rotor circuit being cut out by the means of sequence-operated contactors.

The unit is automatic in that as the air receiver rises to full pressure the motor stops,

and as the pressure decreases it restarts.

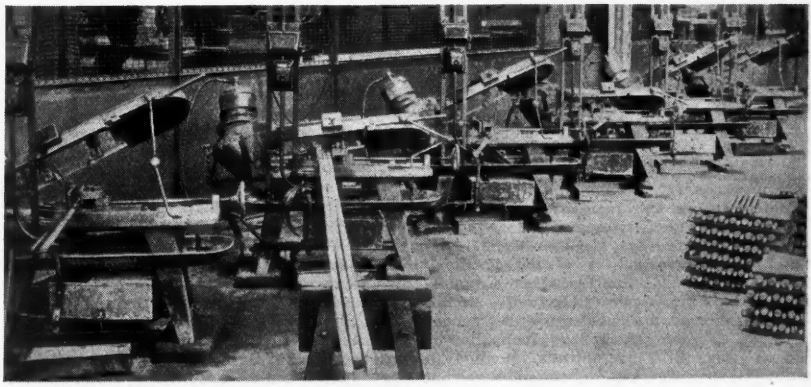
Many of the Sten-gun components are produced from extruded bar metal, and this is sawn up into the required lengths by a battery of horizontal band saws, each of which is driven by a 0·5-HP, 1,425-RPM squirrel-cage motor. A special feature of these machines is that the motor is provided with a double extension shaft and the opposite end to the driving end is connected to a flexible shaft which provides direct transmission to the coolant pump. As the metal is sawn through, limit switches come into play and stop the motor. A great number of automatic lathes are used in the production of the turned components of which one is worthy of special note. This is a six-spindle "Conomatic" automatic lathe which produces the head case rear from $1\frac{7}{8}$-in. bar steel. This machine is driven by a 30-HP, 1,460-RPM motor mounted on the top of the machine. All the motions are transmitted by direct gearing, including the rotation of the workhead, the operation of the toolslides and the pressure coolant.



Air for the lathe chucks is supplied by a 500-cu. ft. per min. two-stage motor-driven compressor

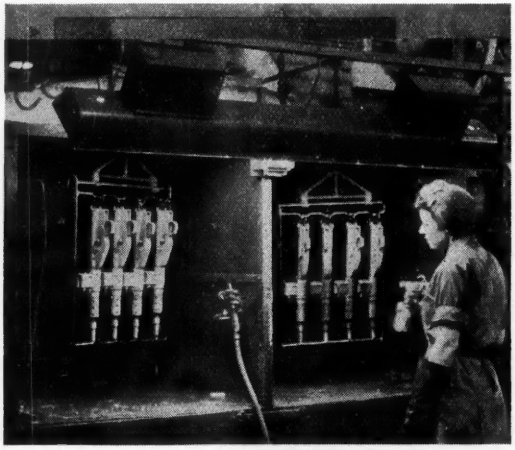
As in the case of the rifle, all parts are Parkerised and then spray painted or stained, but the Sten gun is painted in a semi-assembled state in the spray booths described in the earlier article. A feature of these booths is the fluorescent lighting.

Throughout the factory the machines are all individually motor driven, and an important electrical feature of the production scheme as a whole is the transport which is



Extruded bar metal for many of the components is sawn up into the required lengths by a battery of horizontal band saws

carried out by a fleet of B.E.V. one-ton electric trucks for which an extensive charging plant is laid out. This installation includes nine Westinghouse charging units. The trucks are brought to the charging station where, in each case, the battery is removed and replaced by a fully charged battery. This method of charging enables the truck to remain in service without the necessity of laying up the trucks during the charging periods. A good deal of electrical space heating is provided in the factory, and this is mainly carried out by the use of low-temperature tubular heaters under thermostatic control.



A feature of the spray booths is the fluorescent lighting

The factory, from a power point of view, is essentially all-electric, and of the many thousands of machines and appliances which we saw we have only been able to give a brief glimpse of a few of those which possess the maximum electrical interest.

We are indebted to the Ministry of Supply for permission to visit the factory and to publish this and the earlier article "Rifle Manufacture," to which we have already referred, and to the factory management.

I.M.E.A. Activities

Convention Papers.—Three papers are to be read at the annual convention of the Incorporated Municipal Electrical Association (Blackpool, June 24th to 28th). Mr. J. Eccles, city electrical engineer, Liverpool, will deal with "The Management of an Electricity Supply Undertaking"; Mr. C. T. Melling, borough electrical engineer, Luton, will have as his subject "Possible Means of Unifying and Equating Electricity Supply Tariffs"; and Mr. R. A. S. Thwaites, chief electrical engineer and manager, Manchester, will speak on "The Provision of Heat by an Electricity Supply Undertaking and some Recent Methods of Application."

Conference on Reorganisation.—We have already made brief reference to the recent conference between the Minister of Fuel and Power and representatives of the electricity supply associations, the Electricity Commissioners and the Central Electricity Board. Amplified information published in the January *I.M.E.A. Journal* shows that the Minister said it was the Government's intention to nationalise the electricity supply industry, but the form and the time of accomplishment were matters for future consideration. The representatives were asked to consider the establishment of a Committee or Committees to discuss various details with officials of the Ministry before a nationalisation Bill was introduced into Parliament.

At the same meeting the Minister stated that the Government proposed to make an early announcement on the subject of voltage standardisation.

Pulverised Fuel Firing.—A committee is being convened by the Central Electricity Board, consisting of representatives of the electricity supply associations, the mining industry and manufacturers of pulverising equipment, for the purpose of discussing all aspects of the use of pulverised fuel firing and particularly its bearing upon the most efficient use of the country's coal resources.

Standard Tariffs.—The Joint Committee of Electricity Supply Organisations has agreed in principle with a suggestion made by the South-East England (Greater London) Committee of E.D.A. that standard forms of tariff should be established. The Electricity Commissioners have been asked to consider the setting up of a joint body representative of the electricity supply industry to discuss the matter.

German Industry and Patents

Suggestions for Control

TWO reports prepared by its "Control of Enemy Industry" Committee have been adopted by the Council of the British Engineers' Association and copies have been sent to the Ministers concerned and to other interested authorities. The first of these is upon the control of German industry and is based on the assumptions that it is not possible completely to de-industrialise Germany and that the manufacture of certain commodities must be permitted; and that although this means that Germany cannot be entirely deprived of capital equipment, some control over its manufacture must be exercised to prevent Germany re-establishing herself as an aggressor.

Possible methods of control are considered. The first is control of raw material imports. The second is the limitation of total production; a total would be fixed for home requirements and reparations, and anything above this would be subject to licence from the Allied Commission. The manufacture of machine tools should be prohibited and their importation should be subject to licence. Another suggestion is that manufacture should be limited to simple parts produced for British or Allied manufacturers who would thus control design and development. The Allied countries should be given the opportunity to satisfy world requirements before Germany was allowed to manufacture for foreign markets and then only by licence. Germany, it is said, should be allowed to carry out only pure research; applied research should be prohibited by denial of facilities. The strict control of educational arrangements is advocated.

A number of means of exacting reparations is proposed including the transfer of plant and equipment to this country, the manufacture of goods to meet urgent needs here and the acquisition of German patents and data.

Recommendations on Inventions

As regards patents, the subject of the second report, the Committee recommends that no moratorium should be allowed in respect of German-owned United Kingdom patents which lapsed during the war. If there is no non-enemy interest in patents still in force they should be cancelled, subject to corresponding action by the Allies. Where patents have been kept in force by the payment of fees by a non-enemy licensee the patent should be sequestrated but preserved for the protection of the licensee under the terms of the licence. The licensee, however, should have the option of cancelling the licence and the patent should lapse when no non-enemy interest in it remained.

It is proposed that exclusive licences granted during the war to work German-owned patents should not be renewed, or new ones granted, until the industry concerned has been consulted, in order that manufacturers shall have a fair participation in the working of German-owned patents.

The Committee considers that the subject matter of hundreds of German patent applications remaining on the files should be made freely available to British industry by publication. The British Government has already agreed that inventions made in Germany since September, 1938, shall not be patentable here; the Committee thinks that similar action should be taken in Allied and, if possible, in neutral countries.

Proposals are made for securing that the owners of British inventions used by Germany during the war shall be compensated and patents granted or reinstated. It is recommended that German-owned patents in neutral countries should be assigned to the Allies or cancelled, if possible.

Reports on Enemy Works

FURTHER reports from the Combined Intelligence Objectives Sub-Committee are available from the Stationery Office. Generally these cover the wartime activities and development of German industry and science but some go beyond this limitation. Brief details of those concerning the electrical and allied industries are given below:—

"German X-Ray and Electro-Medical Industry" (File No. XXIII, price 2s.) gives names of the leading producers of X-ray equipment and deals particularly with the Siemens-Reinigerwerke A.G. and the Metallgussgesellschaft. Details of noteworthy work in the production of tubes and associated equipment and materials are given.

"Englebert Factories—Liege and Aachen: Kabelundgummiwerke, Eupen" (File No. XVII, price 6s.) covers the production and general operation of the factories named, with notes on raw materials and the make-up of insulating compounds. A list of the principal German and Austrian cable makers is given in one of the appendices.

"Aluminium Woerwerke, Erbtwerke Gravenbroich" (File No. XXII-4, price 1s.) deals with the electrolytic production of aluminium from bauxite, the rolling of anti-radiolocation strip, and the recovery of aluminium from swarf and dross and scrapped aircraft.

"The Production of Bi-Metallic Strip in Germany" (Final Report No. 84, price 1s.) supplements information already available in the United Kingdom. The more widespread

use of high manganese steels is said to be of interest.

"Television in France" (File No. XI-1, price 6d.) gives information collected during visits to the Compagnie de Compteurs, Montrouge, and the studios of the R.D.F.

"Visit to Eindhoven, Holland, October, 1944" (File No. X-13, price 1s. 6d.) briefly describes the work of the Philips X-ray laboratories and works and gives details of some special welding electrodes developed during 1943-44.

PARLIAMENTARY NEWS

By Our Special Reporter

IN the House of Commons last week, the Prime Minister announced that Marshal of the R.A.F., Lord Portal, had been appointed head of the department of the Ministry of Supply dealing with the provision of materials necessary for the work of the research and experimental establishment engaged in atomic research at Harwell, near Didcot. Professor J. D. Cockcroft had been selected for the post of director of the establishment. Professor Cockcroft was at present director of the Canadian experimental atomic energy plant and it had been arranged with the Canadian authorities that he should remain in this position until a successor was found.

Electric Cookers

Mr. Wilmot (Ministry of Supply and Aircraft Production) said the rate of production of gas and electric cookers was now sufficient to cover the known requirements for new houses, both temporary and permanent. The production rates for December, 1945, were: Gas cookers, 15,050; electric cookers, 8,650.

In reply to Brigadier Peto, who asked the President of the Board of Trade why his department had instructed the manufacturers of electric cookers to sell their products to electric light and power companies only and not to the ordinary retailer, Mr. Belcher, Parliamentary Secretary, said that no such instructions had been issued by the Board of Trade.

North Wales Electrification

On January 29th, Sir Henry Morris-Jones asked the Minister of Fuel and Power, what were the prospects of the electrification of the rural area in North Wales; and whether the scheme of development by the North Wales Power Company is being held back at his request, pending nationalisation.

Mr. Shinwell said that he was informed that work to the value of some £240,000 had been approved by the North Wales Power Company since the end of the war, of which work to the value of some £76,000 had already been carried out and that in addition, the company had under consideration work to the value of £330,000. The greater part of such work represented development in rural areas. No such schemes were being held up pending nationalisation. On the contrary, it was his desire that all normal development of this kind should proceed. though, of course, the rate of progress must depend on the availability of labour and materials. As had already been announced, the electricity supply industry had given him an assurance that all normal development would proceed in the interim period.

Stafford Supply

Captain Swingler asked the Minister of Fuel and Power, whether his attention had been drawn to the proposed schemes of electricity supply of Stafford Corporation and the North-West Midlands Joint Electricity Authority to the Silkmore housing estate, Stafford; whether he was aware that these schemes involved the duplication of high-voltage cables and the unnecessary use of expensive equipment owing to the arbitrary boundaries of the supplying authorities; and what action he proposed to take in the matter.

Mr. Shinwell said that the answer to the first part of the question was in the affirmative. As regarded the second part, the observations of the Commissioners and the North-West Midlands Joint Electricity Authority were being awaited and a decision could not be given until they were received.

Television

Mr. H. Wilson said that the London Television Service would be reopened in a few months' time with its pre-war equipment. This was for the Marconi-E.M.I. system which was chosen in 1936 in preference to the Baird after adequate competitive trials.

Willesden Power Stations

Mr. Bevan (Minister of Health) said that he was in communication with the Electricity Commissioners and understood that certain measures were in hand to mitigate alleged nuisance caused by vapour and grit emitted from the Willesden power stations, and he was arranging for a visit by one of his inspectors to report to him on the conditions and to recommend what further measures could be taken.

B.B.C. Accounts and Licences

Answering a question by Mr. Gammans, Mr. Morrison, the Lord President of the Council, said that the reason for the increase in the wireless licence charge was that the product of a 10s. licence was already insufficient to cover the cost of the B.B.C.'s home services, a cost which would progressively increase.

Suppliers and Consumers

Proposed Alteration of the Law

LEGAL enactments governing the relation between and respective rights of suppliers and consumers of electricity are examined by MR. W. FENNELL (formerly Mid-Cheshire Electricity Supply Co., Ltd., and Mersey Power Co., Ltd.) in a paper prepared for the Institution of Electrical Engineers with the object of suggesting the kind of revision he considers to be necessary.

Existing complicated provisions of the several Acts are briefly pointed out, amendments being suggested in respect of the limits and conditions of supply in compulsory and permissive areas. For instance it is proposed that provisions for compulsory mains extensions should be subject to periodical revision. Radical shortening of the procedure of requisitioning of supplies by two or more intending consumers, without guarantee or specific provision for security, is demanded and, also, that local authority and public board undertakings should be made liable to the same monetary penalties as those imposed on companies for failure to comply with binding requisitions.

Turning to service connections, the author considers that, if retained, the "limit of right" of a consumer (within 50 yards of a main, fixed when 110 V distribution prevailed) to receive a supply needs to be extended to 200 yards, providing the undertaking is relieved of responsibility for so much of the voltage variation as could be accounted for by any length of service line in excess of, say, 100 yds.

Length of Free Service

The "free" portion of service line should be up to 60 ft. underground, or 50 yards (one span) overhead whether it be situated on the consumer's premises or elsewhere. Multiple-service lines should be recognised, by the introduction of regulations for sharing their first cost and maintenance expense, to cheapen and facilitate the connection of small groups of consumers in tenement buildings and otherwise.

The declaration of "maximum power" now required from intending consumers and the liability of the latter to pay for alterations to service lines necessitated by increasing demand beyond the capacity of existing lines, are both considered to offend against the present-day spirit of public utility service because they do not encourage the supplier to provide adequate service connections at the outset and discourage consumers from extending their uses of electricity.

Charges for supply, minimum and maximum, methods of limiting profits and dividends, and the "no-preference" clauses of the Act of 1882 are commented on with suggested amendments.

Authorisation of inspection and inquiry are discussed as well as various aspects of metering; the option of consumers to own their meters should cease; the Electricity Commissioners should have power to fix a basis for meter rents and the meter examiner should have power to determine any dispute regarding the accuracy of a meter, acting upon the request of either party, not only "if the consumer so desires."

Students' Problems

Views on Various Subjects

OVER a hundred attended the London I.E.E. Students' meeting on January 29th to join in discussion on several previously announced problems which were propounded by Committee members. Of the possibility of burning coal underground for power generation in Great Britain it was suggested that it would only be worth while if power requirements were so urgent that the waste of coal by-products would not matter. That domestic radio receivers might well be standardised prompted comment that a receiver cannot be designed for quality *and* range of reception, though a standard model might well be part of the equipment of every house. The case for the adoption of 60-cycle power supply was considered to be a very slight one.

The optimum side-band width for local radio transmitters was thought to be about 8 to 10 kc/s, because though its increase might permit increased quality, which could better be obtained with frequency modulation, its decrease had been found adversely to affect quality. As to whether emergency portable power plants could be used for rural electrification it was suggested that, even if the economic case were satisfactory, the plants might not have been designed for long-term continuous operation. Discussion on the desirability of standardisation in the electrical industry brought forth the usual comments on economy of mass production and availability of standard spare parts.

Views on the News

Reflections on Current Topics

SEVERAL friends of mine have had a pamphlet in which it is suggested (in opposition to the commonly accepted view) that the general illumination values required in factories coming within the scope of the Factories (Standards of Lighting) Regulations, 1941, are likely to injure eyesight. This might be so if no provision were made for shielding from the eyes light sources of a brightness exceeding 10 candles per sq. in. (a very small percentage of the value usually found out-of-doors), but the prescribed mounting heights and suitably designed fittings can quite easily prevent glare of this kind. Misapprehension of terms employed in the various Reports of the Departmental Committee on Lighting in Factories is presumably responsible for the statement that the general working illumination recommended as a minimum has increased from 0·25 ft.-candle in 1915 to 6 ft.-candles to-day. The former referred to floor level and the latter to 3 ft. above it—a very different matter.

* * *

Experience of the value of good lighting has certainly tended to raise the level of illumination, and I have been unable to find any medical evidence that this trend has been harmful. On the contrary such eminent authorities as Sir John Parsons and the late Dr. R. J. Lythgoe have pointed out the dangers of eyestrain and general deterioration in health as a result of prolonged working under low illumination. The criticisms referred to above embrace fluorescent lighting also, but presumably cannot be intended to relate to the general theme of preservation of eyesight in view of the low surface brightness of the newest light source, that of the 80-W tubular lamp being only some 3 candles per sq. in. On the question of expense, the lighting load is usually only a small percentage of the total industrial load and overall annual charges incurred in improving it have usually been abundantly justified in saving in materials, man- and machine-hours, especially having regard to the downward trend of prices for electricity.

* * *

Last week I accepted an invitation from the House-Building Industries' Standing Committee to inspect some demonstration permanent houses built to selected designs in a competition organised by the Committee. Let me say at once that the dwellings appeared to me to be good value for the suggested price (although this has not been finally settled). What is not so good is the inadequacy of the electrical provisions, or perhaps I should say the dominance of gas equipment. In one pair, at Eastcote, Middlesex, there is certainly electric lighting, the fittings in the main rooms are rather attractive, and there are plug points. But the cooking, heating and water heating are done by other methods. In another pair, at Hayes, Middlesex, lighting and plug points have also been provided and there are small portable fires in two bedrooms, but that is all.

To be fair I should commend one thing which I observed in the Eastcote houses. This was the provision of a cord-operated ceiling switch for bathroom light. Next to having the switch outside this is the most desirable arrangement although, of course, it will not prevent the tenant from plugging a radiator into the lampholder.

* * *

The Electrical Development Association is a member of the Standing Committee and its name appeared on a board in front of the Hayes houses as being responsible for the electrical installation; it wasn't mentioned at Eastcote. I have reason to know that the Association has been working hard on the new housing question and is not to be blamed because none of the demonstration houses was not more electric, even if not all-electric. It keeps in close touch with all these projects and exercises as much influence as possible. For instance, it notifies the electricity undertakings in areas where new houses are to be built so that they can get in "on the ground floor." Thus the initiative has to come from the local electrical people, but E.D.A. affords all the help it can when the decision is made. I should mention that the houses now in question are "private enterprise" dwellings; I believe that public authorities are not so wedded to gas as many private builders are.

* * *

Stratford-on-Avon Town Council is objecting to the use of overhead lines in the neighbourhood of the town by the S.W.S. Electric Power Co. and an inquiry has been held.

CONSUMER: "Aid me with that store of power you have" (*All's Well That Ends Well*, V (i).)

COMPANY: "Our power is ready; our lack is nothing but our leave" (*Macbeth*, IV (iii).)

CORPORATION: "Dare you to presume to harbour wanton lines?" (*Two Gentlemen of Verona*, I (ii).)

The last word is with the Electricity Commissioners and they can find their own quotation.—**REFLECTOR.**

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Electricity Supply Clerical Staffs

MR. W. E. BOSTON'S suggestion regarding the formation of an Electricity Supply Clerks' Association is interesting and timely. Personally, however, I would like to see such an Association extended to embrace not only electricity supply clerks, but also clerks engaged in gas and water undertakings. In other words, let it be a Public Utility Clerks' Association. Such a combined association would have a much greater negotiating strength.

Although one hesitates to recommend an increase in the number of secretarial and accountancy associations, yet there is, I think, room for one catering for the special requirements of public utility undertakings' clerical staffs. Recognition of the specialised nature of the commercial activities of public utilities is given by at least one of the British Universities in its syllabus for degrees in commerce, and this lends support to my case.

The examinations instituted by such an association could provide alternative subjects to meet the needs of individual students, such as gas or water engineering economics instead of electrical engineering economics, mentioned by Mr. Boston.

Crawley, Sussex. D. A. J. WELCH.

YOUR correspondent, Mr. G. A. Simmons, has performed a service to clerical staffs in drawing attention to the position of clerical workers in the electricity supply industry. He is, however, incorrect in stating that no organisation exists to meet the needs of these workers.

The Clerical and Administrative Workers' Union caters for electricity supply staffs, and has established standards of salaries and conditions, by negotiation with individual undertakings. In other words, where clerical staffs have enrolled with the Union, the Union has secured protection for them. It is true, however, that considerable sections of clerical workers have not yet organised and thus lack the means of representation. It is also true that to date no national negotiating machinery exists to cover clerical staffs.

This is a position that can be remedied, however. The means of organisation exist in this Union. The absence of trade union organisation among the clerical grades in the past has placed them at a disadvantage. They will, therefore, welcome the information that the Union is taking steps to extend its organisation in the electricity supply industry, and will supply full information to clerical staffs in the industry.

Glasgow. B. ANNE GODWIN,
Assistant General Secretary,
Clerical and Administrative Workers' Union.

Induction-Motor Protection

IN your issues of July 13th, October 19th and November 9th articles appeared about the protection and maintenance of squirrel-cage induction motors. In these were discussed the difficulties of providing a form of protection which takes care of every fault condition, such as overload, single-phasing and phase faults without the use of complicated and costly devices.

Smaller and medium-sized motors, especially where direct-to-line starting is applied, are protected nowadays in most cases by thermal overload relays. The duty of these relays is to follow as closely as possible the heat characteristics of the motor, and to switch it off when it or part of its winding reaches a dangerous temperature.

As these relays cannot protect against short circuits, the protective switch is in some cases also provided with magnetic overload relays without time delay, set at about five to seven times the full-load current, in order to prevent tripping during the starting period.

Instead of, or in addition to, the magnetic relays fuses are often installed before the starter, in order to protect motor, cable, thermal relays and contactor against short circuits. When high-rupturing-capacity slow-acting fuses of the proper size are applied, they are also able to protect against overloading. When star-delta or auto-transformer starting is employed, thereby reducing the starting current, magnetic overload relays with oil damping are often applied. For large motors special relays may be used, connected *via* current transformers, working on the induction principle or with thermal elements.

A protection not mentioned in the aforesaid articles is that often used for single-phase motors. This consists of a bimetallic strip,

mounted on the motor itself. At a certain temperature, the bimetallic element clicks over, thus breaking a contact and stopping the motor. Some have a manual resetting device; others are without and re-start the motor after cooling down.

These devices are reliable and inexpensive and could be used also for three-phase motors by connecting them in series with the tractive-magnet coil of the contactor starter or the no-volt coil. A small two-core cable from motor to starter is therefore required.

For larger motors more of these temperature relays are required, located at different points of the stator, since local overheating may not spread evenly over the whole motor. The use of expensive and complicated relays can be avoided this way. As in this system the temperature of the motor is the leading factor and not the current, it seems to me that it can be applied successfully in many cases.

Aruba, West Indies. A. P. SIPMAN.

Technicians for the Mines

REGARDING Mr. G. A. Ross's letter in your issue of January 25th, one must deprecate the suggestion that the acquiring of a certain academic standard automatically entitles young mining craftsmen to promotion to the grade of technical officials.

It is most desirable that even a craftsman doing responsible inspection, maintenance and repair work on the increasingly varied and complicated mining machinery and electrical apparatus, should possess considerable technical knowledge, and the status and pay of such men should be appreciably raised as a first step. The difference between their earnings and those of the average "mechanised" face-workers and contract men is quite indefensible, even acknowledging that the latter are on an artificially high level which the industry cannot support indefinitely.

Secondly, the attaining of a high academic standard does not necessarily bestow the other important attributes which the higher technical officials should possess. Too often the youths trained under the ordinary colliery-cum-technical training schemes, where existing, are drawn chiefly from the local labour supply and from homes where, unfortunately, the "anti-boss" atmosphere has had a lasting effect on the youth's outlook, thus unfitting him for posts which demand high devotion to the job and to the industry as a primary qualification. Where, however, these handicaps are absent, it would be a tragedy to lose potential technical officials to other industries just at this time when the colliery industry as a whole is facing a serious shortage of technicians for the implementing of the large-scale modernisation and re-organisation schemes which are impending.

Any colliery concern therefore which has a surplus of highly-trained craftsmen or junior technicians whom it cannot reasonably "accommodate" would be doing the industry a great service by putting them into touch with other colliery groups who are, in many cases, much less fortunately placed.

South Yorkshire. "COLLIERY ENGINEER."

Municipal Reports

THE 1944-45 report of the general manager of the Mountain Ash Electricity Department (Mr. E. W. Jones) shows that the value of installation work carried out and domestic appliances sold reached the record figure of £6,923 (against £4,114 in the previous year). Electricity sales, at 4 million kWh, represent an increase of 21 per cent. on 1943-44. On the financial side, the year was marked by two discounts in place of the usual one. In the Christmas quarter the normal lighting flat rate of 2d. was reduced to ½d. per kWh for the first 100 and 1d. thereafter, and in the March quarter a special "victory bonus" was granted in anticipation of victory in Europe, the net charge being 1d. per kWh for the first 100 and 1½d. per kWh for additional consumption. Total revenue for the year was £27,968 (£28,110) and there was a net profit of £244 (£4,650). There were no loan charges; a statement included in the report shows that since 1919 £25,850 has been borrowed and all of this has been repaid.

Chepping Wycombe

Figures given in the 1944-45 annual report of the borough electrical engineer of Chepping Wycombe (Mr. H. Robson) show that the average consumption by domestic and commercial consumers rose from 568 kWh in 1940-41 to 876 kWh last year, and for all uses from 1,165 to 2,655 kWh. These increases of 54 and 128 per cent. Mr. Robson compares with the 16½ and 53 per cent. for the whole country.

Total sales in 1944-45 amounted to 36 million kWh (against 33·5 million in 1943-44) at an average price of 1·52d. (1·51d.). Revenue aggregated £229,992 (£213,303) and working expenses were £169,959 (£152,099), there being a net profit after deduction of loan charges, etc., of £22,335 (£22,884). Income tax and war damage contribution provision amounted to £20,656 (£33,122), leaving a surplus of £1,679.

Electrical Research

Report of the E.R.A. for 1944-45

ACCOMMODATION for an expanding scale of working is placed in the forefront of its post-war activities by the British Electrical & Allied Industries Research Association in its report for the twelve months ended September 30th, 1945. Illustrations of the comprehensive nature of the work of the Association are provided by two new items relating to cooling-tower performance and grindability of coal. Further progress has been made in the Association's novel designs for circuit-breakers of the highest power with the aid of the heavy testing plant of members. A similar scientific problem is raised in work carried out for the Welding Research Association in which the arc is the essential agent but has some of the features of an undesired by-product. The uniform character of electric discharges, in spite of their diverse applications, has led to concentrated studies along these lines.

Electrical interference with communications has come to the fore in view of possible legislative action; many of the difficulties are technical and these are engaging the attention of the Association. A notable occasion during the year was the presentation of a paper before the Institution of Electrical Engineers on jewels and pivots which, it is believed, will be accepted as a standard reference work.

Wartime Investigations

A large proportion of wartime secret investigations into dielectric phenomena will, it is expected, shortly become available. These include relationships between structure and dielectric properties of long-chain substances, with especial reference to the influence of temperature. Researches on capacitors include sealing against moisture, the effect on life at high temperatures of contaminations, impregnants with high dielectric constants, tissue paper and the possibilities of polyethylene as a dielectric. Substantial progress has been made in regard to moisture permeability in varnish films. A report will shortly be issued on the effects of aging on the plastic yield and electrical properties of composite dielectrics.

Experimental determination of temperatures causing charring of cable papers, of the effect on short-circuit ratings of circuit-breaker reclosure and of bursting strength of cable sheaths form the subjects of important work of a more immediately practical nature. Corrosion of composite conductors, joints of aluminium conductors and reinforced-concrete stay blocks are among the matters in hand for overhead-line transmission. Reports are being prepared on the current loading of pipe electrodes in parallel, the use of reinforced concrete water mains for earthing, the design of earthing clips and the fatigue strength and tensile strength of grooved cadmium-copper trolley wire.

The resistance of unprotected outdoor conduit joints which are not fully tightened has not increased seriously over a period of years, when assembled to a high standard of workmanship, and the relative efficiency of different methods of protection are now being studied. A critical résumé is being prepared on the design and use of network analyses on supply systems.

Air-Blast Circuit-Breakers

Most of the recent experimental work at Perivale on current-zero phenomena has been in correlating data relating to the single-air-blast breaker under different conditions. Materials for arc extinction in the hard-gas switch have been rated in order of merit. Examination is being made of the features of circuit-breakers which may produce voltage rises on interrupting small currents in inductive circuits, including the series of voltage rises followed by sudden breakdowns in a fraction of half a cycle. Much field work has been done to ascertain maximum voltages to be expected when long overhead or composite lines are de-energised. The heavy-duty gas-blast breaker has been made capable of giving contact separation with reasonable accuracy at any desired point on the current wave. Formulae have been evolved for the area of burn and mass of copper lost from plug electrodes of air-blast breakers at currents up to 30-kA (RMS). An auto-oscillograph is under construction for delayed recording of random phenomena. Direct recording by cathode-ray of the arc current near the current zero has been achieved with RMS currents up to 500 A.

A detailed account has been prepared of the relationship of composition, heat treatment, grain size and micro-structure to the creep strength of carbon steels with a view to determining the causes of abnormally high creep rate. Apparatus has been constructed to study creep behaviour of superheater tubes at 1,000 lb. per sq. in. and 950 deg. F.

In electricity supply technology, the E.R.A. load model, previously described in the *Electrical Review*, and the relation between daylight illumination and system load are notable. A number of tests have been put in hand on resistance-welding and arc-welding installations. Particular attention has been devoted to the application of scientific sampling to consumers doing a certain thing, *e.g.*, using a given kind of appliance, and the distribution and average value of a variable quantity, for instance, the rateable value of houses. It is intended to organise a nation-wide sampling survey to gather information on obscure points of domestic

supply. Sampling is also being applied in a research into the annual kWh consumption of certain domestic appliances.

Fundamental questions of the changes that occur in rolling and thermal treatment of low-loss sheet steel and the mechanisms that cause power loss when a sheet is in an AC magnetic field are being investigated under Sir Lawrence Bragg at the Cavendish Laboratory. With regard to the former, attention is being paid to the growth of crystals and modification of their orientation; there are also some hints of change of internal stress and of impurity content. It seems possible that the usual method of separating hysteresis and eddy-current losses is not always permissible and that hysteresis loss is itself frequency dependent and related to the structural features mentioned. A report of the past two years' work on permanent magnets at the same laboratory is being prepared.

Under Professor Sucksmith at Sheffield a method of determining the magnetic constants on short specimens with small length-diameter ratios has enabled the variation of the coercive field of alloy Cu_4 $FeNi_3$ with time of heat treatment at various temperatures to be determined.

Investigations have shown that the capacitor transformer would be an economical substitute for the voltage transformer for abstracting small amounts of power from high-voltage systems, subject to modifications of the circuit. A report is being prepared.

The series of fifteen tests on surge protection apparatus referred to in the last annual report has been completed and the results are being analysed. The aim is partly to improve the performance of the surge filter. Further progress has been made with the calculations of surges induced by lightning strokes and the Report contains details of investigations of importance.

For facilitating the Association's work in connection with rural electrification a field station is being erected at Shinfield Green near Reading. Recent activities include low-pressure sterilising charts, automatic low-powered units, hay-drying and a number of horticultural applications.

Under the heading of "Heating, Cooking and Allied Problems" there appears a statement that the best results with intermittent heating in rapidity of response are obtained with a wall covering of high thermal resistivity and low specific heat and thick enough to prevent heat escaping into the base material. The effect of reflectivity is not appreciable until its value exceeds 0·5. References are also made to the heat pump and radio-frequency heating among other subjects and to the Association's technical inquiry service.

Large American X-ray Machine

A DESCRIPTION, with illustrations, circuit diagrams and performance curves, has appeared in *Electronic Industries* (December, 1945, p. 90) of the 100 million volt X-ray machine that has been built at Schenectady by the General Electric Co. of America. In physical aspects the outfit is similar to a cyclotron, its main feature being an electro-magnet weighing about 130 tons the purpose of which is to accelerate the stream of electrons circulating through a hollow evacuated glass (toroid or doughnut) ring in which the tungsten wire target is mounted.

Instead of the DC field energising the cyclotron, an AC (60 c/s) flux is used in magnetic structure; which is of the laminated shell type with an air gap in the centre leg. The glass toroid, whose outside diameter is 74 in. and about equal to that of the centre leg, is placed in the air gap. Surrounding the centre leg are two coils, one at the top and the other at the bottom, each carrying 1,000 A to produce a field in the plane midway between the pole pieces, the intensity of which varies inversely as the $\frac{3}{4}$ power of the radius and amounts to about 4,000 gauss at the electron orbit.

The electrons introduced from a "gun" are accelerated at the average rate of 400 V per revolution in a circular path, by the flux through the centre of the toroid rising from zero to maximum during a $\frac{1}{4}$ cycle period. The $\frac{3}{4}$ power relationship of the field strength to the radius keeps the electrons sharply focused within the orbit. The electrons perform 250,000 revolutions in $\frac{1}{4}$ cycle, travelling 800 miles; since the average rate of acceleration is 400 V per revolution, the total reaches 100 million (Mev) electron volts. An ignitron valve, whose discharge time is regulated by a saturable transformer in a phase-shift circuit, introduces a heavy pulse of current from a 58-μF capacitor into an auxiliary winding which is parallel to the main winding on the centre leg of the transformer core. This pulse changes the $\frac{3}{4}$ power relationship of the magnetic field strength to the radius and so causes contraction of the orbit of the electron stream. After a few micro-seconds the orbit shrinkage is sufficient for the electron stream to start glancing off the tungsten target, so releasing an X-ray beam.

Industrial Design Exhibition

To give manufacturers more time to produce their new designs for display at the "Britain Can Make It" exhibition arranged by the Council of Industrial Design with Government backing, the date of the exhibition has been postponed from July to September 24th. It is to be held at the Victoria and Albert Museum and will run for about a month. Executive committees to aid in the selection of designs for exhibition are being set up for various industries, including the electrical and radio.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE President of the Institution of Electrical Engineers, **Dr. P. Dunsheath,** and **Mr. W. K. Brasher,** Secretary, who are now in Canada, are paying an official visit to the Engineering Institute of Canada to convey greetings from the three senior engineering institutions of this country. Yesterday (Thursday) Dr. P. Dunsheath was to deliver a discourse on "The Contributions of British Engineers to the Allied Cause," on the occasion of the sixtieth annual general meeting of the Institute in Montreal. He is to speak on "The Engineer Family in the Commonwealth" at the annual banquet of the Canadian Institute to-day (Friday). He will also be the guest speaker at a luncheon of the Canadian Club when his subject will be "The Engineer and the Community," and he will address a combined meeting of students from Magill University and L'Ecole Polytechnique. While making this visit the opportunity will be taken to meet in New York the officers of the American Institute of Electrical Engineers, the Institute of Radio Engineers in America, and of other engineering institutions there. The President and Secretary expect to return about the middle of this month.

Mr. F. W. Purse, chief engineer to the London and Home Counties Joint Electricity Authority, has agreed to continue his service with the Authority for a further twelve months.

Mr. Felix A. Rogers has resigned from the position of secretary of the British Refrigerator Association and the Council has appointed the assistant secretary, **Mr. J. B. Blackwell,** to succeed him. In making the change the Council has placed on record its appreciation of the services rendered to the Association by Mr. Rogers.

Captain C. H. Mellor, A.M.I.E.E., formerly of the Shanghai Power Co. and the Inspectorate of Mechanisation, India Command, has joined the staff of the Rangoon Electric Tramway & Supply Co. and is sailing for Burma immediately. Captain Mellor's family will remain in this country for the time being; their address is "Oldfield," St. Boniface Road, Ventnor, Isle of Wight.

Mr. Paul Adorian, assistant managing director of Broadcast Relay Service, Ltd., is visiting the West Indies and South America in connection with the company's business.

Mr. J. T. Pearson, buyer and production manager of C. A. Parsons & Co., Ltd., retired on January 31st after nearly fifty years' service with the company. Mr. Pearson commenced work at Heaton Works in 1896 as an apprentice and became a draughtsman in the electrical drawing office. In 1912 he was placed in charge of all production work and a short time afterwards was made responsible also for the buying of all material. Sir Claude Gibb, C.B.E., chairman of the company, presented Mr. Pearson with an inscribed gold cigarette case subscribed for by his many friends and colleagues at Heaton Works.

Mr. Reginald Halsall has been appointed deputy secretary of the Central Electricity Board. During the greater part of the war he was an assistant secretary in the Ministry of Aircraft Production, and from the end of 1944 held a similar appointment with the Board of Trade. Mr. Halsall was formerly in the service of the Board of Inland Revenue.

Mr. I. A. Bailey, general manager of the Mond Nickel Company's refinery at Clydach, South Wales, since 1936, has been appointed managing director of Henry Wiggin & Co., Ltd., a wholly owned subsidiary. **Mr. J. O. Hitchcock,** of the Nickel Co.'s development and research staff, has been appointed personal assistant to the managing director of Henry Wiggin & Co.

Mr. R. M. Parry, sales manager of Henry Wiggin & Co., has been appointed sales assistant to the managing director of the Mond Nickel Co. **Mr. R. E. Ansell,** formerly technical service manager, becomes sales manager of Henry Wiggin & Co.

Mr. T. Handley has resigned his position as Leeds depot manager with Ensign Lamps, Ltd., to become sales manager of P.E.C. Industries, Ltd., Wells Road, Ilkley, Yorks.

Mr. A. G. N. Dixey has been appointed secretary of the Edison Swan Electric Co., Ltd., and Edison Swan Cables, Ltd.

Mr. J. W. Ridgeway, O.B.E., manager of the Radio Division of the Edison Swan Electric Co., Ltd., has been appointed a director of the company.

Mr. G. N. Emmet, B.A., has been appointed general manager of the Noma Electric Co., Ltd. For the past eight years he has been on the executive staff of Hoover, Ltd.

Mr. C. H. Lockwood, district manager for Messrs. Hirst, Ibbetson & Taylor, Ltd., electrical and radio factors, Topping Street, Blackpool, has just retired. His successor as district manager is his chief assistant, **Mr. W. MacKenzie.**

Mr. K. M. Sowerbutts, B.Sc., A.M.I.E.E., of Worcester, has been appointed mains superintendent to the Bedford Electricity Department.

Mr. C. McCausland, A.M.I.E.E., has retired from the position of resident engineer with the Bournemouth & Poole Electricity Supply Co., Ltd.

Mr. S. D. Lay, F.I.E.S., who since 1937 has been lighting engineer with the British Thomson-Houston Co., Ltd., in the Newcastle area, has recently been appointed lighting engineer for

Courtaulds, Ltd., with headquarters in Coventry. He was honorary secretary of the Newcastle Centre of the Illuminating Engineering Society since its inception until this year when he was elected vice-chairman.

Mr. S. F. Bickell, M.I.E.E., has severed his ten years' association with British National Electrics, Ltd., and Archibald Low Electrics, Ltd., as their technical and works manager to take up a new appointment.

Mr. J. H. Osborn, constructional assistant, West Midlands Joint Electricity Authority, has been appointed deputy engineer and manager to the Wallasey Electricity Department at a salary of £723 per annum.

Besides those already mentioned, **Mr. W. Andrew Bryce,** managing director of W. Andrew Bryce & Co., Ltd., was awarded the M.B.E. in the New Year Honours.

Obituary

Mr. F. Parkinson.—The funeral of Mr. Frank Parkinson took place on February 1st, at Guiseley, Leeds. The chief mourners were:—Mrs. Doris Parkinson (widow), Mr. and Mrs. Arthur Parkinson (son and daughter-in-law), Mr. Albert Parkinson (brother), Mr. Denis Burke (stepson), Lady Forrest (mother-in-law), Mr. and Mrs. Patrick (sister and brother-in-law) and family, Miss Webb, Mrs. Edith Howarth, Mr. and Mrs. J. Crabtree, Mrs. Bolton and Mrs. R. E. Appleyard (cousins), and Miss Macintyre (personal secretary). Among the representatives of Crompton Parkinson, Ltd., were Mr. E. C. Holroyde, Mr. and Mrs. J. H. Fryer, Mr. C. F. Dickson, and Mr. T. H. Windibank (directors); Mr. F. Le Neve-Foster, Mr. J. H. Johnson (who also represented the Old Cromptonians), and Mr. Herbert Foster. Leeds University was represented by Col. C. H. Tetley, Pro-Chancellor, Professor Frank Smith (also representing the Vice-Chancellor, Mr. B. Mouat Jones), Professor A. V. Williamson, and Mr. E. J. Brown, Bursar. There were also many representatives of electrical and other companies.

Mr. C. T. Westlake.—The death occurred at Eastbourne on January 25th of Mr. Cyril Thorn Westlake, who in 1944 retired from the position of borough electrical engineer of Chepping Wycombe (High Wycombe). Mr. Westlake, who was sixty-seven, was born at Swindon and after education at the Merchant Venturers' Technical College, Bristol, he joined the Guernsey electricity works in 1899 as a junior engineer, eventually becoming chief assistant. In 1919 he was appointed engineer and manager of the Newbury electricity undertaking, leaving in 1922 to go to High Wycombe where he remained as borough electrical engineer when the Corporation in 1938 acquired the undertaking from Wycombe (Borough) Electric Light & Power Co. At the funeral on January 28th at Willingdon the High Wycombe Electricity Department was represented by Mr. H. Robson (borough electrical engineer), Mr. A. Blake (assistant engineer), Mr. Sterrett and Miss Merton.

Mr. G. M. Clark.—The death occurred on January 29th at Whitstable of Mr. George Muirhead Clark, M.A.(Cantab), M.Inst.C.E., aged seventy-six. He worked with Dr. E. H. Griffiths, M.A., on the measurement of temperature (embracing resistance thermometry), and obtained his technical training with Crompton & Company, Chelmsford. After a period as chief assistant to Sir Alexander Kennedy, F.R.S., on the economics of power station design and operation, he was appointed Government Adviser and Electrical Engineer to the Cape of Good Hope in 1899. Among other positions which he held during the twenty-five years that he was in South Africa were those of consulting engineer to the Victoria Falls and Transvaal Power Co., Ltd., and consulting engineer to the Municipalities of Pretoria, Johannesburg, Bloemfontein and others for the construction of electric power stations. He resided in India for about a year as chief engineer, Calcutta Electric Supply Corporation, and was in Egypt for three years. He retired to Whitstable about fourteen years ago but continued to act as an examiner for the Institution of Civil Engineers. He was president of the South African Institution of Engineers in 1917-18.

Mr. W. Kells, manager of the Liverpool branch of W. T. Henley's Telegraph Works Co., Ltd., died on January 31st at the age of fifty-two. Commencing at Henley's Liverpool branch in a junior capacity in 1910, Mr. Kells was appointed chief assistant in 1922 and branch manager in 1933. He had been absent from duty through illness since April, 1944.

Mr. W. Gilbert.—We regret to record the death on January 23rd of Mr. Walter Gilbert, who had been associated with Harcourts, Ltd., as art director since 1920. He was responsible for the design of lighting fittings for a number of important contracts carried out by the company, including fittings for the *Queen Mary* and *Queen Elizabeth*, and for many public buildings.

Mr. A. A. B. Walford.—The death occurred at Norton, Stockton-on-Tees, on January 26th, of Mr. Adolphus A. B. Walford, J.P., F.C.A., chairman of Newman & Watson, Ltd., electrical and heating engineers.

Mr. Thomas Woods, of Darwen, who died on January 30th at the age of sixty-two, was head of the firm of Wightson & Woods, electrical engineers.

Wills.—**Mr. S. J. Benham,** chairman of Benham & Sons, Ltd., left £94,057. In addition to 2,050 shares which he had already given on trust to his employees, he left a further 1,625 shares for a similar purpose and £500 for the staff.

Mr. C. E. Fairburn, chief mechanical and electrical engineer to the L.M.S. Railway Co., who died on October 12th last, left £47,071.

Rural Supplies

Twenty Years of Development at Chester

IN view of the increase in the use of electricity for agriculture and other rural supplies, particularly during the war, the experiences of the Chester electricity undertaking during the past twenty years may prove helpful. The City Council was one of the first distributing authorities to attempt complete electrification of a rural area, being authorised to supply 139 sq. miles containing approximately a population of 80,000 and 18,000 dwellings.

From the inception of the scheme a two-part tariff has been offered. Initially it was 24 per cent. of the net annual value of premises plus 1½d. per kWh, but reductions had brought the rate down to a fixed charge of 19·25 per cent. in 55 sq. miles adjacent to the city boundaries, and 22 per cent. in the remaining 84 sq. miles of the area plus 0·66d. per kWh. Until the war consumers were able to hire cookers, fires, washboilers and water heaters, and hire-purchase any reliable apparatus and wiring installations. The scheme was commenced in 1924 and Table No. 1 shows the progress in five-year periods.

Table No. 2 gives classified agricultural holdings in the area and the progress in the use of electricity on 950 holdings. Of agricultural holdings from 50 to 100 acres 70 per cent. are connected, from 100 to 150 acres 70 per cent., from 150 to 300 acres 79 per cent., and over 300 acres 77 per cent.

Throughout, the scheme has been developed on the basis of a revenue from electricity amounting to £20 per annum per £100 of capital expenditure and proceeding forthwith with extensions when agreements are entered into either by individual or groups of consumers to provide the requisite annual revenue within three years.

Mr. S. E. Britton, the city electrical engineer and manager, says that in the past there has not been sufficient frank and

TABLE NO. 1
SUMMARY OF DEVELOPMENT, SALE OF ELECTRICITY AND FINANCIAL RETURNS

	5 Years ended March, 1929	5 Years, 1934	5 Years, 1939	5 Years, 1944	Increase since 1939
Miles of high-voltage lines	44·52	86·31	123·87	124·33	—
Miles of low-voltage lines	55·41	115·11	184·62	200·81	—
Number of substations	33	84	147	162	—
Capital expenditure	£91,885	£180,296	£269,227	£281,667	4·6%
Income	£16,718	£31,550	£55,455	£105,121	89·6%
Income per £100 of capital	£19·5	£17·5	£20·6	£37·3	81·1%
kWh Sold	1,528,104	5,099,960	11,476,775	20,799,306	81·2%
Number of consumers	2,021	5,191	8,273	9,423	13·9%

TABLE NO. 2
AGRICULTURAL HOLDINGS—RESULTS IN 5-YEAR PERIODS

	At March, 1934				At March, 1939				At March, 1944			
	Connected.	kWh sold.	Income.	Average.	Connected.	kWh sold.	Income.	Average.	Connected.	kWh sold.	Income.	Average.
			£	£			£	£			£	£
1	114	288,971	2,324	19·48	178	521,704	2,884	16·20	200	654,845	3,631	18·15
2	128	314,965	1,824	14·25	212	646,377	3,272	15·43	238	1,487,448	6,933	29·13
3	69	239,423	1,249	18·10	123	474,673	2,220	18·05	140	521,385	2,759	19·71
4	56	117,374	702	12·53	118	335,382	1,465	12·42	145	507,177	2,212	15·25
5	35	88,967	596	17·03	75	254,913	1,228	16·37	95	435,747	2,207	23·23
6	57	290,442	1,487	26·09	110	806,305	2,875	26·14	122	857,852	3,749	30·73
7	10	67,125	324	32·40	10	97,826	378	37·80	10	98,152	422	42·20
	469	1,407,267	8,506	18·30	826	3,137,180	14,321	17·34	950	4,562,606	21,913	23·07

Size of group and total number of holdings in 1944:—1: Over 1 not exceeding 5 acres, 425. 2: Over 5 not exceeding 20 acres, 463. 3: Over 20 not exceeding 50 acres, 251. 4: Over 50 not exceeding 100 acres, 206. 5: Over 100 not exceeding 150 acres, 136. 6: Over 150 not exceeding 300 acres, 155. 7: Over 300 acres, 13. Total holdings, 1,649.

intimate co-operation between electricity supply and farming, and the supply industry has not exercised its statutory powers as fully as the public interests deserve. Neither has the public shown much appreciation of the inherent facilities of a public electric service, nor given outward encouragement for the development of a comprehensive system throughout the country. Before the war the most friendly farmers were somewhat hesitant in their dealings with representatives of the supply authority. With many of these the war has brought about freer intercourse and there is now a noticeable tendency to regard those connected with supply undertakings as part of the essential organisation for intensive farm production. Farmers realise that in an extensive application of electricity there is a service which goes a long way towards counteracting some of the major difficulties which are met with in present-day farming.

The immediate question is whether farmers will readily discard obsolete methods and in their place adopt electrical methods to the full when it is made available. Should the answer not be in the affirmative there would be less justification to advocate first-class priority for the reorganisation of the industry with an adequate system of supply to every district where the requisite number of possible users exists for the development of an economic supply.

Small Undertakings' Disability

Although a large proportion of agricultural areas is served by a comparatively few supply authorities the fact remains that there are more than 600 statutory authorities. Mr. Britton asserts that many of these are too small to equip themselves with adequate staff and other essentials to cater for the proper requirements of agriculture and consideration should be given to merging them into undertakings capable of meeting the needs of consumers.

Electricity supply will not pull its full weight in the national interest until it gives greater service to consumers and potential users, and undertakes the onus of providing the capital necessary to take the supply to the premises of consumers, and is also prepared to provide consumers with all classes of approved electrical apparatus and wiring installations on acceptable terms.

Mr. Britton emphasises that it is important to accept as a first principle that all capital moneys invested in providing electricity for agricultural districts and by agriculture in providing electrical apparatus and wiring installations on farm premises are to be recovered from the consumers of the commodities sold and services rendered, and the major problem facing the supply authorities is to achieve this end in the quickest and most economical manner.

To this end a yard-stick acceptable by all parties is urgently needed to assess the amount of capital that can be prudently involved. Guidance may be gained from a consideration of the practical benefits and personal gains derivable from a full service of electricity and the fullest use of man-power. A decision might result from a consideration of the agreed minimum wages and conditions of labour in the agricultural industry, and the minimum income required from the sale of electricity in relation to the capital expenditure involved.

Industry and Research

A TWO-DAY conference on Industry and Research, under the auspices of the Federation of British Industries, will be held at the Kingsway Hall, London, on March 27th and 28th. The leading subject will be the application of science by industry and the part that research can play in promoting industrial efficiency, exports, full employment and a higher standard of living. The conference will be divided into four sessions, as follows:—

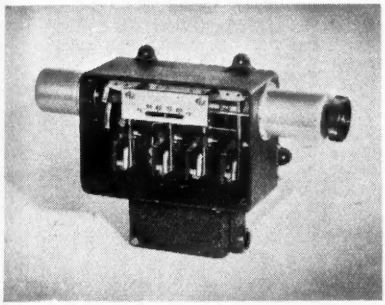
Session 1.—*Science, Industry and the Community.*—Speakers: Sir William Larke, Sir Edward Appleton, F.R.S., Sir Harold Hartley, F.R.S., and Sir Ernest Simon. Session 2.—*Scientific Research and Production.*—"Research and Quality," by Dr. J. R. Hosking (director of research and development, Paints Division, I.C.I., Ltd.); "Research and Production Costs," by Mr. A. Healey (director of production, Dunlop & Co.); "Conversion of Research into Production," by Dr. C. C. Paterson, F.R.S. (head of the G.E.C. Research Laboratories). Session 3.—*Scientific Research and Industrial Expansion.*—"How New Industries Arise," by Dr. R. E. Slade (lately research controller, I.C.I., Ltd.); "Modernisation of Processes and Plant," by Mr. C. H. Davy (chief research engineer, Babcock & Wilcox, Ltd.); and "The Part Co-operative Research Can Play," by Mr. A. J. Philpot (director, Scientific Instrument Research Association. Session 4.—*The Application of Research in Industry.*—"The Firm with a Research Department," by Dr. P. Dunsheath, President I.E.E.; director and chief engineer, W. T. Henley's Telegraph Works Co. Ltd.); and "The Firm without a Research Department," by Sir Raymond Streat (chairman, Cotton Board).

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Multi-step Thermostats

THE "on-off" control of large heating installations may be simple, but it produces mains surges and may cause excessive temperature fluctuation. These disadvantages can be overcome by stepping down the load as the temperature nears its set value. It is naturally desirable for both load reduction and temperature regulation to take place automatically and for that purpose the BRITISH THERMOSTAT CO., LTD., Windmill Road, Sunbury-on-Thames, Middlesex, has produced a range of multi-step "Teddington" thermostats.



Multi-step multiple switch thermostat

Thermostats of this type contain from two to six switches, actuated by a common temperature-sensitive element, but arranged to operate in sequence as the temperature rises at intervals of about 1½ deg. F. The intervals remain constant, regardless of the temperature to which the thermostat is set. The AC switch rating is 5 A at 250 V and they are generally used to control banks of heating elements through contactors, thus making it possible to handle single- or three-phase circuits of any required power. The sensitivity is high, differentials of less than 1 deg. F. being obtainable.

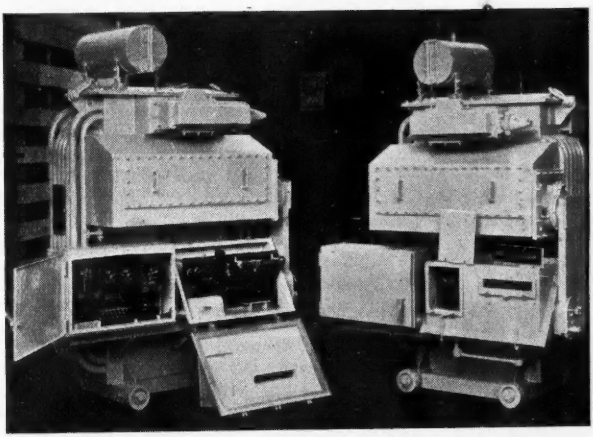
The contacts are normally arranged to break circuit on rising temperature, but the reverse action can be provided for special applications. In some cases, too, both normal and reverse-acting switches are fitted, the former for heating element control and the latter for starting up fans, operating motorised valves, lighting signal lamps, etc.

These thermostats are made both in self-contained "room" form (as illustrated) and with capillary tube and sensitive phial for insertion in hot air ducts, etc., at a remote point.

Tap-changing Transformers

For both industrial distribution and public supply networks utilising a comparatively large number of small substations, on-load automatic tap changing on the high-voltage side of each transformer can provide effective voltage regulation. This method is now used for relatively small units by the BRITISH ELECTRIC TRANSFORMER CO., LTD., Hayes, Middlesex. Type SDA is suitable for circuits up to 11 kV and a maximum of twelve voltage steps. Mercury switches are used as sparking contacts to reduce maintenance.

The shaft on which the drums are mounted has to move only a fraction of a revolution per tap change and is driven through reduction gear. One revolution of the operating shaft moves the driven member by one pitch distance of the pegs. The mechanism is not reversible, so that the drum is locked in its position and, furthermore, the transmitted motion is not constant in speed. With the driving spindle making one revolution at constant speed, the drum begins to rotate very slowly, accelerates



Delta-star 11,000/400-V transformers of 200 and 300 kVA with on-load tap-changers

to the maximum and then gradually slows up again as it comes to the stopping point, so avoiding any necessity for the operating gear to be stopped very accurately, which simplifies its design.

Automatic control gear can be arranged for either local or remote operation. For the regulation of distribution voltages the local automatic type is very suitable. It comprises a combination of a voltage governor with time delay relays (adjustable up to approximately 60 seconds) to prevent tap changes being initiated by momentary changes of voltage. An over-current relay prevents operation on excessive overloads. Two limit switches are fitted on each extreme tapping position, one controlling the motor circuit directly and the other interrupting the circuit between the voltage governor and the time delay relay for that particular direction of movement.

New Switches

Two products recently introduced by ARCOLECTRIC, LTD., Edwin Road, Twickenham, Middlesex, are both provided with moulded bodies. One of them is a miniature push switch for table lamps; a steel ratchet converts the push action to rotary motion, so permitting a quick make and break with wiping contacts, which is a rather unusual feature for so small a model.

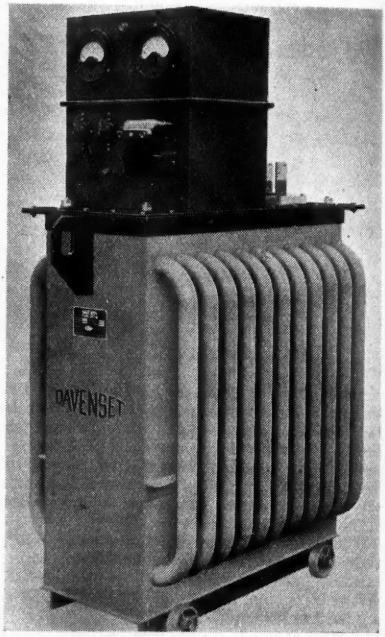
The other is also a push switch for controlling staircase lighting. It is of the semi-vacuum, or dash-pot, type actuated by depression of a cylindrical plunger which thus forces air out of the interior by means of a fixed piston. At the same time a coiled spring is compressed in order

Miniature table-lamp switch and vacuum-push type for staircase lamps

to return the push member to its extended position at a speed of travel that is governed by the rate at which air is readmitted through a small adjustable valve in the base. Thus settings can be adjusted from a few seconds up to several minutes "on" duration. The recessing model is illustrated and a surface type will shortly be available.

Plating Rectifiers

Oil immersed selenium plating rectifiers are a new product of PARTRIDGE, WILSON & CO., LTD., Davenset Works, Evington Valley Road, Leicester. They are available in two sizes,



500-A Davenset plating rectifier

500-A and 1,000-A, the former measuring 26 in. wide by 44 in. long by 56 in. high (including the control panel mounted on top) and occupying a floor area of about 8 sq. ft. Units can, of course, be run in parallel to give higher current capacities and by means of contactors can be arranged to come into operation automatically.

The selenium plates are rated well under their specified capacity, and cooling is adequate to allow for ageing. Control is variable from half to full load and comprehensive safety precautions are embodied. In addition to the thermal overload device on the contactor starter giving protection against transformer shorting or failure on the DC side, there is a thermostat in the top of the oil chamber arranged to give an audible or visual signal should the temperature rise unduly. A test switch shows whether the circuit is operating satisfactorily.

Unified Boiler Control—I

Adaptation of the System to Pulverised Fuel Plants

By W. Szwander, *El. Engr. (Warsaw), M.I.E.E.*

THE unified boiler control system* entails the use of DC motors for driving all boiler auxiliaries, the DC supply voltage being varied to maintain constant steam pressure with load changes. By suitably co-ordinating the speed against voltage characteristics of all the motors, a single voltage-regulating device can adjust the quantities of fuel and of air supplied to the furnace as well as of the flue gases extracted from the boiler in accordance with the prevailing boiler output conditions and also maintain them in the most satisfactory ratios to one another, ensuring the highest boiler efficiency. Apart from other advantages considerable power can also be saved through the smooth regulation of all fans by speed control.

Originally used with stoker-fired boilers, this system of control has been adapted also to the specific requirements of the increasing number of large boilers equipped with pulverised-fuel-fired furnaces.

Special Requirements of P.F. Boilers

There are fundamental differences between the requirements of auxiliary drives for stoker and pulverised-fuel-fired boilers. In the first case the speeds of all auxiliary services vary from practically zero at no-load to the prescribed values at maximum load, so that motor speed variations can be obtained by changing the magnitude of the armature voltage only. A fundamental feature of pulverised-fuel installations is the transporting of pulverised coal by means of air flow, the velocity of which must not drop below a certain minimum value. Therefore fan outputs and speeds must not fall below a definite minimum even at practically zero boiler loads.

With a variable-voltage DC supply having its voltage at boiler no-load dropping approximately to zero (so as to provide the required induced- and forced-draught fan-speed characteristics), it would be uneconomical for any motors connected to the same supply to maintain with these low armature voltages definite speeds above zero (by field control), as the motor frame sizes would then have to be increased considerably. Two independent DC supply sources are therefore used with pulverised-fuel boilers. One is a variable-voltage system (as for stoker-fired boilers) from which the draught fans are supplied; the other, with constant voltage, is provided mainly to supply the motors driving the exhausters or the mill fans (in general the fans supplying the coal-carrying air).

Speed variations of the last-mentioned fans are obtained only by field control of their motors, synchronism of these variations with boiler load changes being ensured by mechanically coupling the field rheostats with the main boiler-load controlling device, *i.e.*, the variable-voltage generator field rheostat or the equivalent apparatus, if grid-controlled rectifiers are used instead of motor-generators.

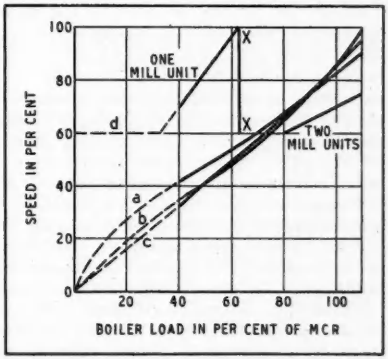


Fig. 1.—Typical speed characteristics of boiler auxiliary services
a, forced-draught fans; b, induced-draught fans; c, stokers; d, exhausters of pulverised-fuel-fired boiler

Fig. 1 illustrates typical boiler requirement curves for a stoker-fired boiler (a, b, c) compared with the required speed characteristics of an exhauster in a pulverised-fuel plant (curve d), for which the horizontal line at 60 per cent. RPM is the minimum coal-carrying speed. The induced-draught and forced-draught fan speed curves in the last case are of the same character as in a stoker-fired boiler (curves a and b). The

* Bibliographical references will appear at the end of the second article.

discontinuity in the speed characteristic d is a result of changing over from one- to two-mill unit operation at a boiler load corresponding to points XX., referred to later.

The majority of modern pulverised-fuel plants are built on the unit (or direct milling and firing) principle, *i.e.*, each boiler has its own mills, the pulverised coal being carried directly to the burners without intermediate storage; therefore only this type of plant will be dealt with in the present article. Unified boiler control could, however, also be applied without difficulty to bin- and-feeder and centralised-milling plants.

DC Motors for Driving Mills

It is both technically and economically sound to utilise the constant-voltage DC source, which must be provided for the exhausters, for supplying also all the constant-speed motors associated with individual boilers; this does not refer, of course, to motors serving more than one boiler, such as those of the ash-handling and coal-handling plant or of oil-fuel pumps. It is a definite advantage in maintenance and operational simplicity to have only one kind of distribution circuit for individual boilers, instead of both DC and AC, with the duplication of associated switchboards, etc.

There are a number of additional advantages to be obtained by making the largest constant-speed motor, the mill motor, a DC machine. The smooth starting of the mills, by steadily raising the armature voltage of a DC motor is definitely preferable to the severe mechanical shock associated with direct starting of squirrel-cage motors, especially when starting a mill partly filled with coal or containing non-grindable material. Some speed adjustment is possible with DC motors by field control without any additional complications, and this allows the selection of the optimum and the most economic speed of operation and its adjustment in accordance with varying coal grades or with the wear of mill components. If necessary, some mill-speed variation with boiler-load changes, as in the case of the exhausters, could also be arranged.

Finally, with all motors of the pulverising equipment supplied from a DC source, sequence interlocks can be easily provided as inherent features of the switching arrangements adopted, this being only partly possible when both DC and AC motors are used for boiler auxiliaries. The increase of cost through using DC instead of AC mill motors and increasing the output rating of the AC/DC converting equipment is to some extent balanced by savings due to omission of high-rupturing-capacity AC control-gear. Besides the mills, the separators or classifiers as well as the air-heaters (if of the rotating type) also usually run at constant speeds, and here again some speed adjustment may be an advantage when using DC motors.

The raw-coal feeder motors are supplied from the variable-voltage DC source and their speed characteristics vary upwards from zero at boiler no-load. For operational convenience the feeder motors can be changed over from the variable to the constant-voltage supply. This feature is utilised during the starting of a boiler when changing over from oil to coal firing, as then the mills must be quickly filled with coal at a time of comparatively low boiler load associated with a low value of the variable voltage.

In some types of pulverised-fuel equipments the feeder motors are controlled to keep a prescribed coal quantity in the mills. This is achieved by switching in and out a resistance in the field circuit of the feeder

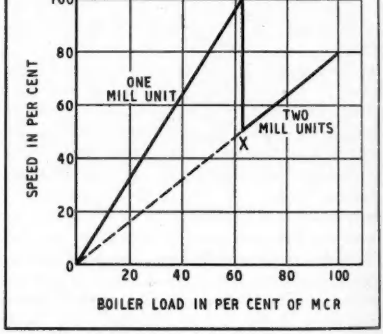


Fig. 2.—Typical speed characteristic of raw-coal feeder motors of a pulverised-fuel-fired boiler

motors, thus varying between two extremes their speed characteristics in respect of the variable armature voltage. The impulses for these speed variations are given by a differential pressure controller comparing the air-pressure drop across the mill with the quantity of air coming into the mill, thus tending to maintain the coal quantity in the mill proportionally higher with the larger

air flow through the mill as it increases with the boiler load.

With the fundamental speed/boiler load characteristic of the feeder motor properly selected (this characteristic can be still adjusted during boiler operation by means of a trimming field rheostat), the supplementary controls of the coal quantity in the mill should operate infrequently, if at all. This case is similar to that of providing in a unified control scheme an automatic furnace-pressure controller, which in principle will remain idle if the f.d. and i.d. fan characteristics are correctly designed for maintaining balanced-pressure conditions.

Variable Number of Mill Units

Pulverised-fuel-fired boilers have another fundamental feature distinguishing them from stoker-fired boilers. In the latter the auxiliary motors of the induced- and forced-draught fans are started when the boiler is put into operation and they run continuously throughout the period of the boiler operation. Only stoker motors have individual resistance starters permitting independent starting. With pulverised-fuel firing the number of mill units in operation is usually varied during steaming periods, so that provision must be made for starting the motors of the mill units at a time when the boiler is on load and when the voltage of the armature supply source must be maintained.

The object of reducing the number of mill units in operation with decreasing boiler load is to obtain the required reduction of the total quantity of the primary or coal-carrying air without reducing the speed of individual exhausters below the admissible minimum.

Reduction of the number of mill units running makes it also possible to obtain power savings with varying boiler loads (*e.g.*, out of the three mill units provided for maximum continuous rating, only two may be required for loads up to the economic load) this also allows for repairs and maintenance of any one mill during boiler operation. This is important because the mills usually have a lower degree of availability than the boilers themselves.

The method used for starting the mill units depends on the fundamental design of the scheme. With one motor-generator or rectifier per boiler, normally used for small- or medium-sized boilers, and in general, usually associated with the "two-boilers/one-turbine" layout, a separate starting motor-generator or rectifier common to all boilers, is provided. This starting set must be suitable for steadily raising its DC voltage from zero to the full value and its rating need be only of the order of 10 per cent. of that of the main set as the mill units are started unloaded. The starting set can also be run during boiler maintenance for driving (at reduced speeds) any of the auxiliary motors, thus avoiding the power losses that would be incurred by using the main set.

Where two motor-generators or rectifiers per boiler are employed, as for "one-boiler/one-turbine" plant or for very large boilers, no separate starting set is required, as one of the main sets can be isolated, using for the purpose of motor starting either one of the two main busbar systems or a special starting busbar; during this starting period the other set alone is capable of carrying the load (the inherent 25 per cent. overload capacity of the set for two hours helps in this respect).

Adjustment of Exhauster- and Feeder-Motor Speed Characteristics

In changing the number of mill units in operation the problem arises of modifying accordingly the speed characteristics of the exhauster (or primary air-fan) motors and of the feeder motors. If at a certain boiler load the number of mill units in operation is changed, say from three to two, the total quantity of fuel supplied to the furnace and depending only on the boiler load must remain unchanged, and therefore the quantity of fuel supplied by each of the two mill units must now be greater than the quantity previously supplied by each of the three units. The necessary change is obtained by modifying the speed characteristics of the feeder and the exhauster motors at the time of changing the number of mill units in operation.

The above explains the discontinuous nature of the exhauster speed characteristic in Fig. 1. A similar characteristic for a feeder motor is illustrated in Fig. 2. Here, with the increasing boiler load, the feeder speed grows from zero; when at a boiler load corresponding (in this example) to 63 per cent. of m.c.r., the second mill unit is put into operation, the speed characteristics of both feeder motors are modified so that each feeder has half the output of the one previously in service. These speed characteristics of feeders and exhausters are referred to, due to their shape, as "saw edge" characteristics.

The characteristics which are illustrated can

apply to a boiler operated with one- and two-mill units or to one operated with two and with three units. Similar characteristics, but with more steps, would apply to the less usual case of a boiler operated with one, two or three units.

These changes of speed characteristics are obtained simply by cutting in or out permanent resistances in the motor-field circuits, either manually or automatically. In the first case additional safeguards are necessary to prevent possible overspeeding of the

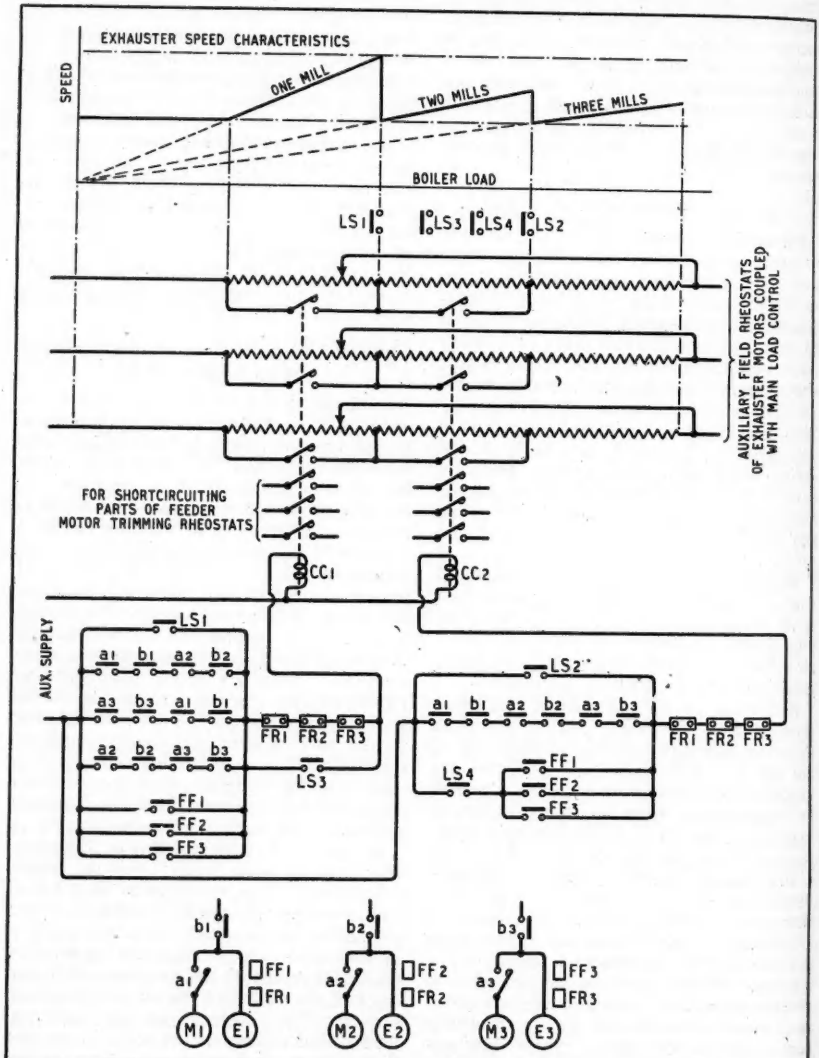


Fig. 3.—Scheme for automatic speed adjustment of exhauster and feeder motors

motors that might be detrimental to the exhausters and feeders. Should the adjustment from the upper-speed characteristic to the lower one in Fig. 2 not be made in time when the boiler load exceeds the value of 63 per cent. of m.c.r., then with further increase of boiler load, the motor speed would continue to increase along the line XY, *i.e.*, above the safe value of 100 per cent. The protection provided against such a contingency consists of tachometer generators coupled to the motors and short-circuiting, through the intermediary of overvoltage relays and contactors, parts of the motor field rheostats, and thus, in case of motor overspeeding, modifying the speed characteristic in the required direction.

Automatic Method

A more satisfactory arrangement is the fully automatic one, in which the required change of motor-speed characteristics is made directly when changing the number of mill units in operation, the factor of the boiler-load value assisting to avoid the possibility of overspeeding. The required motor-speed characteristics (shown at the top of Fig. 3) are obtained by inserting in the exhauster-motor field circuits the auxiliary rheostats (shown below the motor-speed characteristics), operated simultaneously with the main boiler-load controlling devices. One speed characteristic is changed to another by short-circuiting the parts of the auxiliary rheostats by the contactors CC1 and CC2. These contactors are kept closed when their closing coils are energised by the auxiliary switches on the main switches through which the power flows to the mill motors. (See diagram at the bottom of Fig. 3). Thus with all three mills running, both CC1 and CC2 are closed and the lowest speed characteristic is obtained.

With two mills running (*i.e.*, with any one of the six switches a_1 b_1 a_2 b_2 a_3 b_3 open) the contactor CC2 opens and the intermediate speed characteristic is in use. Finally, with two mills stopped, CC1 also opens and the upper speed characteristic is obtained. The limit switches LS1 and LS2, provided on the main boiler-load controlling device at the points corresponding to loads, the exceeding of which requires the use of two or of three mills, ensure, *e.g.*, that the one-mill speed characteristic is not used beyond the boiler load corresponding to the position of the limit switch LS1, thus preventing the possibility of overspeeding of the motors.

A sudden change of the motor-field current, caused by closing or opening of one of the contactors CC1 or CC2, could produce a current surge in the exhauster motor armature which might be excessive for the commutators. Protection against this is provided by "fluttering" relays FF1, FF2, FF3 for the forward current and FR1, FR2, FR3 for the reverse current, so arranged to operate on overcurrent as to counteract temporarily the operation of the contactors CC1 and CC2 which has caused the overcurrent. Thus the change of speed takes place smoothly, with the contactors CC1 and CC2 closing or opening not at once, but through a short period of dying oscillations. The additional limit switches LS3 and LS4 are used to ensure discrimination between the required operation of either contactor CC1 or CC2 by the same set of fluttering relays.

The feeder-motor speed characteristics must be modified simultaneously with the exhauster-speed changes and the contactors CC1 and CC2 have additional poles to short-circuit suitable parts of the feeder-motor trimming rheostats. On account of their small power ratings the feeder motors need not be protected by separate fluttering relays against sudden speed variations. When only one automatic speed-characteristic adjustment is required, *e.g.*, from one- to two-mill operations in schemes with two mill units or from two or three mills in schemes with three mills, in which one-mill operation is not a normal condition, then only the contactor CC2 with its controlling circuits is required, and the whole diagram is considerably simplified.

The article will be concluded in next week's issue.

Huddersfield Agricultural Exhibition

AN exhibition of agricultural electrical equipment is to be held in the showrooms of the Huddersfield Corporation Electricity Department, Market Street, from February 27th to March 16th. Besides dairy and farm equipment, an all-steel model electric kitchen will be on view. On the educational side, members of the National Farmers' Union are to be invited to hear an address by Mr. C. A. Cameron Brown, of Edmundsons Electricity Corporation, Ltd. Although Huddersfield is not primarily an agricultural town, there are nevertheless, upwards of two hundred farmers within the area supplied by the Corporation Electricity Department, including a number of poultry farmers and horticulturists.

Forthcoming Events

Saturday, February 9th.—*Leeds.*—Hotel Metropole, 3 p.m. Association of Mining Electrical and Mechanical Engineers (Yorkshire North West Branch). "Commutator Variable Speed Motors," by W. Acton.

Monday, February 11th.—*Wolverhampton.*—Electrical Sports and Social Club, St. Mark's Road, 6.45 p.m. E.P.E.A. (Midland Technical Group) "Integrating Meters—Accuracy Levels," by M. Whitehead.

London.—Royal Society of Arts, John Adam Street, Adelphi, 5.30 p.m. Institution of Electronics. "Glass for Electron Tubes," by Dr. J. H. Partridge.

Nottingham.—Corporation Gas Showrooms. Nottingham Society of Engineers. Discussion on the Severn Barrage Report.

Newcastle-on-Tyne.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. "Some Notes on Transformer Practice with Reference to Standardisation," by A. G. Ellis.

Cardiff.—South Wales Institute of Engineers, 5 p.m. I.E.E. Western Centre. "Practical Aspects of Telephone Interference arising from Power Systems," by P. B. Frost and E. F. H. Gould.

Tuesday, February 12th.—*Loughborough.*—Loughborough College, 6.30 p.m. I.E.E. East Midland Sub-Centre. "Frequency Modulation," by K. R. Sturley.

Wednesday, February 13th.—*London.*—Institution of Electrical Engineers. 5.30 p.m. I.E.E. Transmission Section. "Joints, Sealing Ends and Accessories for Pressure Cable," by L. G. Brazier.

Thursday, February 14th.—*London.*—Connaught Rooms, W.C.2, 12.45 for 1 p.m. British Refrigeration Association. First annual luncheon.

Institution of Electrical Engineers, 5.30 p.m. I.E.E. Installations and Measurements Sections. Joint meeting. "The Analysis of Vibration Problems," by A. J. King.

Friday, February 15th.—*London.*—21, Albemarle Street, W.1, 5.15 p.m. Royal Institution of Great Britain. "The Protection of Ships from Magnetic Mines," by E. C. Bullard.

Connaught Rooms, W.C.2, 12.15 for 1 p.m. Electrical Commercial Travellers' Association. Annual luncheon.

Newcastle-on-Tyne.—Neville Hall, Westgate Road, 6.30 p.m. I.E.E. North-Eastern Centre (Students' Section). "An Analysis and Description of Automatic Voltage Regulators," by R. K. Edgley.

Saturday, February 16th.—*Leeds.*—Electricity Offices, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. "Atomic Physics in Theory and Application," by R. L. Russell.

Monday, February 18th.—*London.*—Institution of Electrical Engineers, 7 p.m. I.E.E. London Students' Section. "The Measurement and Reduction of Noise," by Dr. A. J. King.

Birmingham.—Grand Hotel, 6 p.m. Birmingham Electric Club. "Electrical Equipment of Hospitals," by W. R. F. Brown.

Liverpool.—Royal Institution, Colquitt Street, 6 p.m. I.E.E. Mersey and North Wales Centre. "Factors Influencing the Design of Electric Lighting Installations for Building Interiors," by R. O. Ackerley.

Tuesday, February 19th.—*London.*—Lighting Service Bureau, Savoy Hill, 6.15 p.m. Association of Supervising Electrical Engineers. "Underground and Overhead Distribution up to 660-V," by L. R. Perkins.

Birmingham.—James Watt Institute, 7.30 p.m. Junior Institution of Engineers. (Midland Section). Special meeting. "Atomic Energy," by Sir George Paget Thomson.

Stockport.—Mersey Hotel, 7.30 p.m. A.S.E.E. (Manchester Branch). "Power Factor," by W. G. D. Gregg.

Luton.—Town Hall, 7.30 p.m. Luton Electrical Society. "Mercury Arc Rectifiers," by A. E. Nicol.

Manchester.—Engineers' Club, Albert Square, 6 p.m. I.E.E. North-Western Centre. "Street Lighting," by E. C. Lennox.

Wednesday, February 20th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. I.E.E. Radio Section. "New Methods for Locating Cable Faults, particularly on High Frequency Cables," by F. F. Roberts.

John Adam Street, Adelphi, W.C.2, 1.45 p.m. Royal Society of Arts. "Radar," by J. I. Randall.

Thursday, February 21st.—*London*—Westminster Abbey, noon. Joint memorial service to the members of the Institutions of Civil, Electrical and Mechanical Engineers who lost their lives in the war.

Sound and Vision

Use of a Common Carrier Wave

THE method of transmitting sound on the vision carrier of a television system (mentioned in the *Electrical Review* of November 9th, 1945, p. 686) is described more fully by MESSRS. D. I. LAWSON, A. V. LORD and S. R. KHARBANDA (Pye, Ltd.) in a paper submitted to the Radio Section of the I.E.E.

The idea of inserting pulses to transmit sound into the line synchronising (vision) intervals is not new, having been the subject of British and German patents in 1933, 1936 and 1943. The pulses are of constant height, but variable width; alternatively either phase or frequency modulation can be used. The frequency response of the system if operated in conjunction with pre-war British transmission would be limited to 5 kc/s.

It is claimed that the method should enable receivers to be simplified and that it offers better programme quality in the presence of severe interference. Additional advantages are that the frequency bandwidth for transmission is reduced; the method of receiving sound ensures automatic volume control; the sound pulses provide a fixed reference level for automatic volume control on the vision channel; mutual interference between vision and sound often present on two-channel reception is avoided; reduced transmission bandwidth simplifies the design of the receiving antenna; mutual coupling between the vision and sound antennæ at the transmitter is avoided; and the installation and maintenance costs of the sound transmitter are saved.

COMMERCE and INDUSTRY

Lord Falmouth on Utility Control.

E.D.A. Annual Luncheon

THE British Electrical Development Association is to hold its annual luncheon at the Connaught Rooms, London, W.C.2, on March 15th (12.30 for 1 p.m.); Lord Brabazon of Tara, the Association's president, will be in the chair. The annual meeting will take place, as usual, after the luncheon.

Electrical Commercial Travellers

The annual luncheon of the Electrical Trades Commercial Travellers' Association, to be held at the Connaught Rooms, London, W.C.2, on Friday next week, February 15th, will mark the Association's twenty-first "birthday" and it is hoped to break all previous records for attendance. Tickets (12s. 6d. each) are obtainable from Mr. S. Johnson, "Woodcot," Ifield Road, Charlwood, Surrey.

Factory and Storage Premises

The Board of Trade has made S.R. & O. 1946 No. 89 (Stationery Office, 1d.) revoking as from January 31st, the Location of Industry (Restriction) Order, 1945, under which a licence was required from the Board of Trade before use could be made of factory or storage premises having a total floor space of 3,000 sq. ft. or over. The revocation does not affect the Government's powers in regard to location of industry under the Distribution of Industry Act, 1945, nor does it in any way prejudice the control over the manufacture of particular classes of goods which exists under other Orders.

Large Mill Motor

The accompanying picture shows the 63-ton armature of a 4,000-HP mill motor (developing 12,000 HP at peak at 43 r.p.m.) which the English Electric Co., Ltd., is supplying to the South Durham Steel & Iron Company's works at West Hartlepool for a reversing slabbing mill equipment.

Acton Exhibition

Over sixty firms are to participate in an exhibition which the Acton Chamber of Commerce is to hold from March 4th to 9th at the now de-requisitioned Renault Works for the purpose of demonstrating the war production efforts of local industries and to promote the change-over to peace-time manufactures. Among the electrical firms which will have displays are Evershed & Vignoles, Ltd.; Rotax, Ltd.; C.A.V., Ltd.; S. G. Brown, Ltd.; British Electric Lamp Works, Ltd.; Lancashire Dynamo & Crypto, Ltd.; Durion, Ltd.; V.G. Manufacturing Co., Ltd.; Landis & Gyr, Ltd.; Eltra Electric, Ltd.; Pilot Radio, Ltd.; Beethoven Electric Equipment, Ltd.; Dubilier Condenser Co., Ltd.; Telegraph Condenser Co., Ltd.; and Modinstal Electric Co., Ltd.

Engineering to be "Decontrolled."

"Decontrol" of Engineering Industry

It was announced on Monday last by the Ministry of Labour and National Service that the Essential Work Order would cease to apply to the whole of the engineering industry on May 4th. Individual undertakings are to receive a month's notice before that date.

The Future of Public Utilities

Speaking at the fourteenth annual meeting of the Conjoint Conference of Public Utility Associations on January 30th, Lord Falmouth emphasised the importance of competition between various fuel industries and declared that whether nationalised or not, or whatever form nationalisation might take, it was of the utmost importance for public utilities to ensure as far as it lay within their power that in the future the consumers should receive the best and most efficient service at the lowest possible charge. This object could be achieved only if the Government from the outset adopted the policy of the closest collaboration and consultation with the representatives of each of the utilities concerned. The actual direction, conduct and operation of each of the services should be left in the hands of those who had spent their lives in that service. He hoped that the precedent

63-ton armature of a 4,000-HP mill motor supplied by the English Electric Co., Ltd.

of the introduction of outside persons and bodies—be they called "Working Parties" or otherwise—into industries would not be followed in the case of the utilities. The provision of the utility services, such as heat and lighting, called for a public utility mind in the supplier and only those who had mastered not merely the technical aspects but what might be termed the human relationship aspects in the utility world could hope to succeed.

Advice on Export

Regional export officers have been appointed by the President of the Board of Trade to stimulate interest in export trade by visits to manufacturing firms in their areas; to discuss with manufacturers the expansion of their exports to the maximum; to discuss with potential exporters methods of determining suitability of products for sale overseas and to find overseas purchasers for these; to introduce the inexperienced to export trade through merchants and otherwise; to explore the possibilities of assistance where there are labour or raw material shortages or shipping difficulties; and to indicate sources from which specialist assistance or information can be secured.

Modern Steam Boilers

An impressive film illustrating the vast amount of research and workshop organisation that goes to the making of a large water-tube boiler is to be shown by Babcock & Wilcox, Ltd., throughout this country and abroad. It also indicates the great advances in technique that have been made in both boiler construction and cinematography since the original silent film "Steam" was exhibited in 1924.

The historical development of the boiler as a unit, together with valves, coal and ash-handling and ancilliary services, the functions of the various components, their influence on coal consumption and their effect in reducing the amount burned per kWh are clearly explained. Some of the most interesting "shots" relate to the research organisation and to the actual manufacturing processes, including the bending and subsequent examination of the plates of the drum in the press, the welding of the seams (which has now practically displaced riveting) and the production from the billet of boiler, superheater and economiser tubes.

A fitting finale is provided by views of the gradual erection of a power station from the finish of the civil engineering work to the raising of steam for starting the turbines.

East Ham at War

A total of 1,454 "incidents", covering all types of missiles, was reported in the borough of East Ham during the war. Of the 44 substations and h.v. switching stations in various parts of the borough 14 were damaged. One steel kiosk and one brick-built substation were completely destroyed, the former being discovered the following day in the next street. A rocket which narrowly missed two high-voltage cables shattered the windows of a nearby substation and drove parts of the window frame with such force into some open-type switches and busbars as to shut down this and eleven other substations, interrupting the supply to two large areas. On September 10th, 1940, one bomb which fell in Poulett Road put out of commission six high-voltage feeders and a pilot cable and a main C.E.B. transformer caught fire, the oil seeping through the cable ducts into the basement of the high-voltage switch room where it was set on fire by the exploding of a feeder cable and trifurcating box. After only 4½ hours both AC and DC supplies had been restored. These are a few of the events recorded in a handsomely produced and illustrated booklet, "East Ham Electricity Undertaking at War—1939-1945," with a foreword by Mr. G. W. Ablitt, the engineer and manager.

Radar for the Mercantile Marine

The Ministry of War Transport in conjunction with the Admiralty recently arranged a series of demonstrations of "blind" navigation in the congested waters of the Thames Estuary. Representatives of shipping companies and of firms likely to be interested in the manufacture of civil radar equipment were able to see an experimental navigational radar set, developed by the Admiralty Signal Establishment, in action aboard H.M.S. *Pollux* and later to exchange points of view.

The apparatus shown made use of a pulse duration of only 1/5 microsecond giving an effective minimum range of about 50 yards; the maximum range was 20 miles. A simple control unit for installation in the chart room carried the cathode ray tube of the plan position indicator and the image of the ship's surroundings could be superimposed on the navigator's chart by means of a half-silvered mirror.

Since the war a number of merchant ships have been fitted with Naval radar sets as a temporary measure, but it is now hoped that the demand will be satisfied through normal commercial channels.

With reference to the demonstration, A. C. Cossor, Ltd., points out that the first successful shipping trials were carried out by the company over a month ago on M.V. *Atlantic Coast* on a run from London to Liverpool *via* Falmouth. The company has based its work on the Plan Position Indicator (P.P.I.), for which a patent application was filed by its research laboratories in 1939, and it expects to have equipment in production at an early date.

Electrical Engineer's Death

A verdict of "Accidental death" was recorded at the inquest at Plympton on February 1st on Mr. Christopher Leonard Lewis, for nineteen years electrical engineer to the Plympton St. Mary Rural District Council.

Mr. H. J. Belcher, mains engineer, said that after investigating a breakdown in electricity on January 23rd he found Mr. Lewis at the power box at Plympton, slumped forward, with his right hand grasping the connecting link and his left hand touching the inside of the box. The heat had severed the right hand to the wrist. Answering a question as to whether Mr. Lewis's work would involve giving attention at times to the power boxes, Mr. Belcher said that it possibly would. He could not understand why Mr. Lewis came into contact with the live conductor, which carried 6,300 volts. At no time had Mr. Lewis seemed worried about his work. It was quite possible that he had fainted while making an examination and had fallen on the apparatus.

Mrs. Beryl Wade stated that her father had asked the Council for assistance in his work, and suitable arrangements were to be made, about which he seemed very pleased. Apart from his health, her father, who was sixty years of age, had no worries, and she was quite certain that his death was due to an accident and that in no circumstances would he have attempted to take his life.

Dr. J. W. M. Owen said that when he saw Mr. Lewis a week before his death he complained of being unable to sleep well and said he was a bit worried over his job, but there were no symptoms of melancholia. Death was due to asphyxia, in consequence of electrocution.

B.E.A. Handbook

Members of the British Engineers' Association have now received their copies of the 1945 Handbook. This contains a list of members of the Council; an alphabetical list of members with particulars of their products, etc.; details of the Association's services to members; and an index to members' announcements, which form the bulk of the volume. A useful inset gives a variety of conversion factors.

Aluminium Exhibition at Manchester

The all-electric aluminium kitchen which forms a conspicuous feature of the Aluminium Development Association's exhibition now touring the country can be seen at Lewis's, Ltd., Market Street, Manchester, until February 23rd. From April 3rd to 20th the exhibition will be installed at Fenwick's, Newcastle. Half a million people have inspected the exhibition up to date.

J. & P. Acquisition

The business of British National Electrics, Ltd., has been acquired by Johnson & Phillips, Ltd., and the works at Newarthill, Glasgow, will be developed for the production of "Charlton" and "Highlow" water heaters, "B.N.E." cookers, "J.P." tubular heaters and other domestic appliances.

Nalder Bros. Vector Meter

In the reference to the vector meter of Nalder Bros. & Thompson, Ltd., in our notes on the Physical Society's Exhibition (*Electrical Review*, January 11th, p. 48) mention was made of the "Futcher" patent. This should have been "Ivcher."

Calendars

The 1946 calendar of E. Dawson (Lamp Factors), Ltd., bears a picture of a smiling brunette.

An attractive desk calendar with an anodised aluminium frame and a date indicator has been received from the Rainville Engineering Co., Ltd.

Pictures of various beauty spots appear on the calendar of Victor Iddon, Ltd.

W. H. Sugden & Co., Ltd., have sent us a useful month-a-page wall calendar with space for noting appointments.

Trade Publications

Murex Welding Processes, Ltd., Waltham Cross, Herts.—Illustrated leaflet (M. 37) describing dual purpose screens and helmets for arc welders.

M.C.L. and Repetition, Ltd., Pool Lane, Langley, Birmingham.—Pocket size booklet illustrating, amusingly, numerous samples of repetition products with facing pages containing general data, standard dimensions, limits, equivalents, etc.

Innoxa Laboratories, Ball's Pond Road, London, N.1.—Priced booklet entitled "The Invisible Glove," describing the uses of "barrier" creams (not soaps) for protecting workers' hands against occupational dermatitis.

Applications for copies of these publications should be made on firms' business notepaper.

Trade Announcements

The telephone numbers of the Bowthorpe Electric Co., Ltd., and its associated companies, the Bowthorpe Engineering Co., Ltd., Hellermann Electric, Ltd., and the Oxford branch of Radiovisor Parent, Ltd., have been changed to Oxford 3184-5-6.

The Luton branch of Alliance Wholesale, Ltd., has been moved to 15, Bute Street, Luton. The telephone number, Luton 3420/1, is unchanged.

The Marshall Electric (1945) Co., Ltd., Mansfield, has changed its name to F. M. Electric Co., Ltd.

The Birmingham office of Ferguson, Pailin, Ltd., has been moved to Windsor House, 656, Chester Road, Erdington, Birmingham, 23. (Telephone, Erdington 3775; Telegrams: "Ferpacolim, Birmingham.")

The former office of British Insulated Callender's Cables, Ltd., at 29, Blagrave Street, Reading, is now closed and the present address is 21, London Street, Reading (telephone, Reading 2801).

Mr. J. M. Reekie, A.M.I.E.E., and Mr. G. R. Reekie, A.M.I.E.E., have formed the Reekie Engineering Co., Ltd., Lochlands Works, Arbroath, to specialise in farm mechanisation, including the electrification of farms and other electrical power requirements.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within one month of January 30th:—

TOWER. Class 9, No. 635,194. Measuring and gauging instruments and apparatus; electric soldering irons; and parts (not included in other classes) of all such goods.—Towcester Tool Co., Ltd., Watling Street, Towcester, Northants.

Design. Class 9, No. 635,557. Scientific instruments and apparatus, electrical instruments and apparatus not included in other classes, films and slides prepared for exhibition.—Common Ground, Ltd., 1a, Sydney Place, London, S.W.7.

MYKROY. Class 16, No. 636,766. Electric insulators and electrical insulating material in the form of sheets, tubes or bars or pieces shaped to fit in electrical apparatus.—Electronic Mechanics, Inc., Clifton, N.J., U.S.A. Address for service c/o Abel & Imray, Quality House, Quality Court, London, W.C.2.

MICOFLEX. Class 22, No. 637,004. Ropes and cordage, none being of metal; string and twine.—Micanite & Insulators Co., Ltd., Blackhorse Lane, Walthamstow, London E.17.

ELECTRICITY SUPPLY

Effects of New Grid Tariff. Plymouth Development Plans.

Abertillery.—NO DOMESTIC EQUIPMENT.—The Welsh Board of Health has rejected a proposal by the U.D.C. to include refrigerators, cookers and immersion heaters in council houses.

Battle.—ELECTRICITY FOR TEMPORARY HOUSES.—Hastings Corporation has arranged with the Battle R.D.C. to provide a supply to 70 temporary houses at a cost of £1,724.

Billingham-on-Tees.—CHANGE-OVER TO ELECTRICITY.—The Urban District Council is to change-over from gas to electric lighting in 280 houses in Cowpen Lane and 120 houses on other sites.

Birkenhead.—NEW POWER STATION.—Preliminary work has been started on the site for Birkenhead's new power station at Bromborough. It is hoped that the first section of the scheme, estimated to cost £4,250,000, will be in operation towards the end of 1948, and that an extension costing £1,800,000 will be in service in September, 1949. In the first stage of construction the station will contain two 50,000-kW turbo-alternators and condensing plant, and four boiler units each having an evaporative capacity of 300,000 lb. per hr.

SUPPLY IN WIRRAL.—The Electricity Committee has recommended the Town Council to approve a scheme, estimated to cost about £24,000, to supplement the electricity supply in the Wirral area and particularly for the Gayton and Heswall districts. Under the proposal a new 33,000-V overhead line will be erected from Eastham to Gayton and Heswall, and arrangements are under consideration for the erection of an additional substation at Gayton.

Brigg (Lincs.). — STREET LIGHTING.—The Chamber of Commerce has complained to the Council about the quality of the present street lighting and has asked that electricity be substituted for gas.

Chester.—SUPPLY EXTENSION.—The Electricity Committee is to extend cables and erect a substation at a cost of £10,700, to provide a supply to the Harthill and Burwardsley areas.

Chesterfield.—SUPPLY EXTENSIONS.—Permission has been received from the Commissioners to the borrowing of £48,540 for the extension of the Council's electricity distribution system in the Whittington Moor, Newbold, Spital, and Mansfield Road areas. Loan sanction has also been received in respect of the extension of the supply to the village of Cutthorpe. The electrical engineer (Mr. W. W. Grimes) reported that he had been asked to supply electricity to the all-electric temporary bungalows to be erected in Grassmoor for the Chesterfield Rural District Council, and the Electricity Committee approved of this being done at the standard charge of 7d. per week per bungalow, plus ½d. per kWh consumed. The electrical engineer was also authorised to extend the mains to the Hady Hill estate.

Colchester.—CRITICISM OF CHARGES.—At a meeting of the West Mersea U.D.C., Councillor E. P. Digby criticised the extra 10 per cent. charged by the Corporation to consumers in outlying districts. Councillor A. Reeve thought that the whole question of charges should be reconsidered. On the domestic tariff the system of basing the fixed charge on floor space meant that people with large houses and big rooms were paying a ridiculously high rate compared with people in more compact houses.

Gillingham.—GRID TARIFF COMPARISON.—At a meeting of the Electricity Committee the borough electrical engineer submitted comparisons (taking the years 1943 and 1944) to illustrate the effect of the new C.E.B. tariff. These showed that the maximum demand and unit charges were increased by approximately 14 and 2·5 per cent. respectively, so that the new tariff would increase the costs for 1946 by at least £4,000.

ASSISTED WIRING.—The engineer recommended that the hire-purchase and rateable value wiring schemes should now be encouraged, and suggested that the latter scheme should be altered by instituting a fixed quarterly charge in place of the charge of 5 per cent. of the rateable value of the house. Originally lamps and shades were included in the installations; shades were subsequently omitted and he recommended that lamps should also be excluded. The proposals were approved by the Committee.

Glasgow.—ELECTRICITY FROM REFUSE.—The convener and sub-convener of the Electricity Committee are to confer with representatives of the Cleansing Committee on the question of the advisability of reviewing the basis of payment for electricity generated at the Govan refuse power works, pending the Corporation's reaching a final decision with regard to the future use of the Govan works.

Gravesend.—HIGHER CHARGES FORESHADOWED.—Referring to the revised C.E.B. tariff, Alderman Clunn stated at a meeting of the Town Council that electricity was costing the undertaking from £6,000 to £7,000 a year more and prices would have to be increased. Alderman Croft spoke of the heavy income tax which the undertaking was paying.

Greenwich.—STREET LAMPS.—The Borough Council has obtained sanction to borrow £2,048 for the provision of 130 electric street lamps on housing estates.

Guildford.—CAPITAL EXPENDITURE ESTIMATES.—The Corporation Electricity Committee estimates a capital expenditure of £103,426 for the next twelve months.

London. — MAINS EXTENSIONS. — The Local Distribution Committee of the London and Home Counties Joint Electricity Authority has approved mains and service extensions costing £10,170.

Middlesbrough.—SUBSTATIONS.—The Town Council is planning the erection of four substations on the Thorntree Estate.

North-Eastern Area.—NEW POWER STATION.—Mr. H. H. Mullen, assistant general manager of the North-Eastern Electric Supply Company, states that in order to meet general needs of Tees-side and Cleveland and new industrial

developments, his company has decided, subject to receiving the necessary directions to build a new power station adjacent to the existing North Tees station. The first instalment will provide a capacity of 120,000 kW.

Plymouth.—DEVELOPMENT SCHEMES.—Sanction is being sought by the Electricity Committee for electricity developments and extensions involving a total estimated expenditure of over £151,000. The city electrical engineer, Mr. H. Midgley, laid before the Committee, a scheme for improved supply to northern parts of the city and also to the Plympton Rural District Council. He explained that the loads, due to new housing estates at Ham and King's Tamerton, would at an early date exceed the capacity of the existing high-voltage network fed from the Prince Rock station. The proposed extensions included a new 33,000-V switch-house, a 33,000-V substation in the Peverell or Mannamead areas, duplicate 33,000-V cables from the Prince Rock station to the new substation and additional 6,600-V cables for interconnection. Mr. Midgley said it was desirable that the extensions to the distribution system should be in commission by the winter of 1947-48. The scheme involved an estimated expenditure of £140,300. Details were also given of a proposed low-voltage cable extension for No. 2 Ham estate, at an estimated cost of £10,735. The Committee adopted the engineer's recommendations and gave authority for tenders to be invited for the buildings, plant and cables.

Rawtenstall.—NEW FEEDER.—The Electricity Committee is applying for consent to borrow £7,598 for an additional feeder cable in connection with the supply to Bacup.

Tynemouth.—PURCHASE TIME EXTENDED.—The Electricity Commissioners have extended the time for the purchase of the New York portion of the undertaking of the North-Eastern Electric Supply Co., Ltd., to January, 1947.

Overseas

Eire.—TURF PRODUCTION PLANS.—A White Paper published by the Department of Industry and Commerce outlines plans for the production of turf in nine counties at a cost of £3,673,000, with an estimated annual output of over a million tons. Agreement has been reached between the Turf Development Board and the Electricity Supply Board for the development, on a mechanical basis, of the Clonsast bog, the turf to be used in a generating station situated near the bog. Similar agreement has been made under which a second turf-fired generating station will be provided in the area of the Brosna basin, in Offaly. It is expected that the full output of this station should be available by 1952, and a partial output a year or two earlier.

In order to encourage a greater consumption of turf it is intended that all new projects for the production of electricity, otherwise than by water power, shall be based on the use of turf, except where it is clearly demonstrated that certain peak loads might with advantage be carried by stations using other fuel.

New Zealand.—CHRISTCHURCH REPORT.—The report of Mr. E. Hitchcock, general manager of the Christchurch Electricity Department, for the year ended March 31st last records a further increase in sales, from 132·3 million kWh to 141·9 million, for which domestic consumption was chiefly responsible. Total revenue was £418,163 (against £399,848 in 1943-44) and expenditure £377,062 (£361,260). Revenue per kWh sold averaged 0·775d. (domestic, 0·612d.; commercial, 1·462d.; industrial, 0·679d.).

TRANSPORT

Glasgow.—TROLLEY-BUS EXPERIMENT.—The Corporation is to experiment with trolley-buses to replace trams on the Polmadie and Provanmill service. The estimated cost of twenty-five new vehicles, overhead equipment, two substations, and cables is £126,000.

Leeds.—TRANSPORT DEFICIT.—A deficit of £45,220 has resulted from the working of the Corporation trams and bus services during the current financial year, while for the next financial year the loss is estimated at £107,770. The question of further revising fares is to be considered by a special sub-committee.

London.—EXTENSION OF TIME.—The London Passenger Transport Board is applying to the Minister of War Transport for an Order extending by two years the time for the carrying out of a number of works and the compulsory purchase or taking over of lands.

Manchester.—TROLLEY-BUS ROUTE EXTENSION.—The Corporation Transport Committee has obtained sanction for the extension of the trolley-bus route from Oxford Road to Moss Lane.

Southend-on-Sea.—OPERATION OF TROLLEY-BUS SERVICES.—The Corporation has given notice of its intention to make two twenty-one year leases from April 1st next by which the Westcliff Motor Services, Ltd., and the Eastern National Omnibus Co., Ltd., respectively, may use trolley-vehicle equipment in common with the Corporation.

South Shields.—TROLLEY-BUSES.—The Transport Committee is recommending the Town Council to use trolley buses in the Horsley Hill area.

Spain.—RAILWAY ELECTRIFICATION.—The Council of Ministers has approved in principle a proposal to electrify about 3,000 miles of main railways.

Orkney Distribution Scheme

A FURTHER Electricity Distribution Scheme, No. 6, was published by the North of Scotland Hydro-Electric Board on Monday. This undertaking in its initial stage is designed to make supply available to two-thirds of the 10,000 inhabitants of the Orkney Mainland apart from those in the district now served by the Kirkwall Council and covers an area of 183 sq. miles. Water power resources in Orkney are restricted, but a project based on a chain of lochs in the north of the mainland is under consideration. In the meantime electricity will be generated by Diesel plant which may be installed at the existing Kirkwall power station. The tariff proposed is approximately the equivalent of 6d. per kWh for lighting and 1d. to ¾d. per kWh for heating and power, which is slightly more than that in Distribution Schemes Nos. 4 and 7, particulars of which were given last week.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

E. K. Cole & Co., Ltd.—The accounts for the year ended September 30th last show that trading profits, which rose by £159,723 in 1943-44, decreased last year by £157,624 to £265,500. The net profit was £97,465, against £138,165, in 1943-44. The ordinary dividend, as already reported, is again 20 per cent., £50,000 (same) is transferred to general reserve and the balance carried forward is increased by £11,160 to £76,758.

The chairman (Mr. A. G. Allen) states that the falling off in deliveries to the various Ministries began before the end of 1944, increased progressively in the early months of 1945, and culminated in heavy cancellations after the end of the European war and, later, of the Japanese war. During the war the company produced and delivered to the Departments and fighting services, radar, radio and other equipment to the aggregate value of £17,750,000.

The company is well on the way to completing the reorganisation of its main works at Southend and is ready to embark on a full programme. He expresses the hope that there will be a speedy end of control, leading to an era of capacity production under the stimulus of healthy competition; only then will it be possible to put real life and vigour into export trade.

Referring to the products of the various divisions, he says that the Radio Division has been concentrating since the war on the development of new broadcast radio and television receivers; in the Lighting Division much development and pre-production work has been carried out in connection with fluorescent and other forms of lighting; the Plastics Division now operates one of the finest plastics factories in the country; and the Special Products Division has kept abreast of all radar and electronic developments. "Thermovent" space heating is being handled by the last-named Division, and redesigned and more efficient models will soon be in production. During his recent visit to the United States, Mr. N. C. Robertson, the deputy managing director, was able to conclude arrangements for the interchange of technical information between the company and certain American companies engaged in similar operations.

R. A. Lister & Co., Ltd.—Mr. F. H. Lister presided at the annual meeting. In a statement circulated with the report and accounts Mr. C. P. Lister, the company's chairman, speaking of the development of export trade, referred to his impending world tour. He stated that the French and Belgian subsidiaries had reopened active business with the company, and he was pleased to say that their capital resources were substantially intact. The board had under consideration an increase in capital to meet the needs of the future development of the company's business at home and abroad, and resolutions would be placed before the shareholders in due course.

J. & E. Hall, Ltd., record a net profit of £98,911 for the year to September 30th last (against £94,705 for 1943-44), after providing £8,000 (£27,000) for E.P.T. but before charging income tax, £45,000 (£50,000). The ordinary dividend is 10 per cent., the same as last year, and £109,720 (£81,809) is carried forward.

Tokyo Electric Light Co., Ltd.—*Reuter* reports that American bondholders have filed a petition with the New York Supreme Court for the removal of the Mitsui Bank of Tokyo as the trustee under the trust agreement, which secures the 6 per cent. bonds. This action was taken to protect domestic and foreign bondholders by proposing the appointment of new trustees.

The Plessey Co., Ltd., has declared a final ordinary dividend of 10 per cent., making 20 per cent. (same) for the year to June 30th, 1945. The net profit was £262,885 (£237,634).

The Power Securities Corporation, Ltd., reports a net profit, before tax, of £103,368 for 1945 (against £102,526 for 1944). The ordinary dividend for the past year is maintained at 6 per cent.

The Yorkshire Electric Power Co., Ltd., is increasing its final dividend on the ordinary stock from 5 to 6 per cent., making 9 per cent. (against 8 per cent.) for the year.

Lancashire Electric Light & Power Co., Ltd.—On Monday last this company offered for subscription 1,000,000 3½ per cent. cumulative preference shares of £1 each at par, part of an increase of £2,000,000 in the capital sanctioned last week. The issue was immediately oversubscribed.

New Companies

Line Equipment, Ltd.—Private company. Registered January 25th. Capital, £10,000. Objects: To carry on and also act as consultants, manufacturers and designers in connection with the business of electrical and general engineers and contractors, pneumatic, hydraulic, mechanical and chemical engineers, etc. Subscribers: C. F. Simmonds and J. A. Manistre, solicitors, 5, Staple Inn, W.C.1. Registered office: 10, Essex Street, Strand, W.C.2.

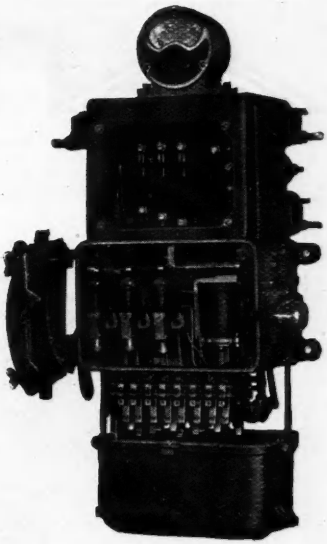
Bookers Lighting & Radio, Ltd.—Private company. Registered January 26th. Capital, £25,000. Objects: To carry on the business of, manufacturers of, and dealers in, radio, dynamos, refrigerators, stoves, cookers, lamps, brackets, fittings, switchboards, control gear, insulators, etc. Subscribers: H. Usick, 31, Manor House Drive, N.W.6, and S. Featherman, 24, Cavendish Road, N.W.6. Registered office: 116, High Road, Kilburn, N.W.6.

Brooks & Blewitt (Electrical & General Engineers), Ltd.—Private company. Registered January 29th. Capital, £2,000. Objects: To carry on the business of manufacturers and repairers of, agents for the sale of, and dealers in, artificial lighting apparatus and electrical engineers, etc. Directors: J. F. Blewitt, 80, Hampton Road, Redland, Bristol, and H. R. V. Brooks, "Clovelly," Severn Drive, Thornbury.

Clive Courtenay & Co., Ltd.—Private company. Registered January 24th. Capital,

Control for squirrel-cage motors

by



TYPE E STAR DELTA, or DIRECT ON

Available up to 50 H.P. 400-440 V

- Robust construction.
- Correct sequence device.
- Overloads—Solenoid type —cut-out in the starting position.
- Triple Pole Isolator, when required, incorporated in same casing.

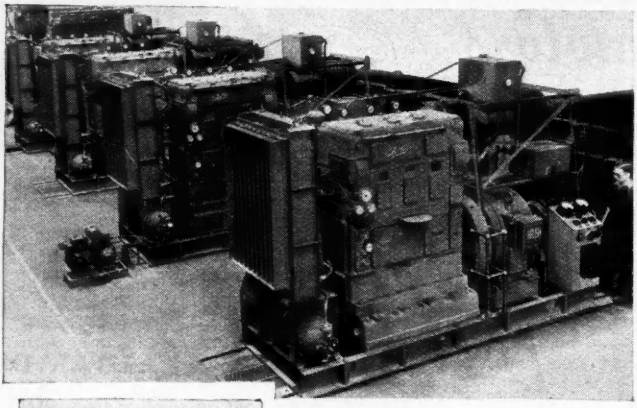
THE VERITY RANGE

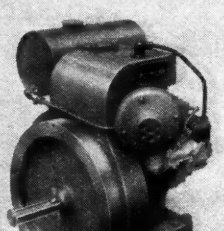
WORKS : ASTON, BIRMINGHAM 6

Sales Headquarters : BRETTENHAM HOUSE, LANCASTER PLACE, W.C.2

D

Petter ENGINES





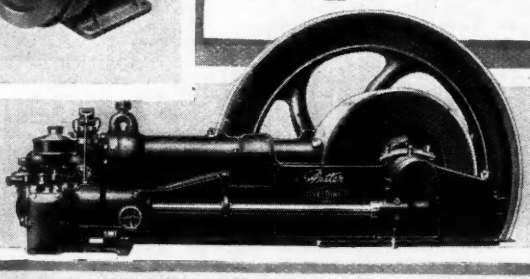
MANY municipalities and industrial concerns have adopted Petter Engines for Power and Electricity Generation because of their proved reliability, the result of sound design and the high standard of materials and craftsmanship used in their construction.

Details of any of the following engines sent on application :—

Petter "Superscavenge" 2-stroke Oil Engines, range from 150 to 450 B.H.P., 2 to 6 cylinder.

Petter Petrol or Paraffin Engines, range 1½ to 3 B.H.P.

Petter-Fielding Horizontal Oil Engines 18 to 65 B.H.P.



PETTERS LTD – LOUGHBOROUGH ENGLAND

7.32a

£1,000. Objects: To carry on the business of manufacturers of, and dealers in, telecommunication equipment, inter-communication systems, measuring instruments, industrial control equipment, telegraphic and telephonic apparatus and fittings; h.f. and v.h.f. equipment applicable to electro-medical and industrial purposes and electronic equipment of all types; electrical, mechanical and radio engineers, etc. Subscribers: J. L. Courtney, 81, Hadley Road, New Barnet, and Ivy M. Mildred, 27, Forburg Road, N.16. Registered office: 118/120, Wardour Street, W.1.

Addison Electric Co., Ltd.—Private company. Registered January 25th. Capital, £500. Objects: To act as consultants, experts and advisers in connection with all kinds of inventions, patents, processes, designs, devices and methods of manufacture. Subscribers: H. W. Fisher, 36, Southampton Street, Strand, W.C.2, and M. E. Crichton, 36, Lyndhurst Gardens, Finchley, N.3. Secretary, Margaret E. Crichton. Registered office: 36, Southampton Street, Strand, W.C.2.

Eastwoods Electrical & Heating, Ltd.—Private company. Registered January 24th. Capital, £100. Objects: To carry on the business of distributors and manufacturers of electrical apparatus, stockists and distributors wholesale to electrical contractors, electricity supply authorities, builders, etc. Directors: G. W. A. Miller, "Lulworth," 24, Carew Road, Wallington, Surrey, and two others. Registered office: 47, Belvedere Road, S.E.1.

Streatham Transformer Co., Ltd.—Private company. Registered January 28th. Capital, £2,000. Objects: To acquire the business of the Streatham Transformer Co., and to carry on the business of manufacturers, importers and exporters of, agents for, and dealers in, transformers, radio, television and electrical apparatus, etc. Directors: S. G. Carpenter (permanent), 19, Farm Road, Streatham, S.W.16, and two others. Registered office: 68, Streatham High Road, S.W.16.

P. R. Electrical Co., Ltd.—Private company. Registered January 28th. Capital, £100. Objects: To carry on the business of electrical, mechanical and general engineers and contractors, etc. Permanent directors: A. H. R. Taylor, 21, Melville Court, Goldhawk Road, W.12, and M. Hoffman, 22, Aldbourne Road, Shepherd's Bush, W.12. Registered office: 21, Melville Court, Goldhawk Road, W.12.

"Silco" Radio Components, Ltd.—Private company. Registered January 28th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, and exporters and importers of, radio, television, radar, electronic and electrical components, parts and apparatus, etc. Directors: M. Adler, "Scarlets," Compton Way, Farnham, Surrey, and Mrs. G. M. Jones, 753b, Finchley Road, N.W.11. Registered office: Gloucester House, 19, Charing Cross Road, W.C.2.

Carl Harrison Electrical Co., Ltd.—Private company. Registered in Edinburgh January 24th. Capital, £100. Objects: To carry on the business of manufacturers, exporters, importers and repairers of, and dealers in, dynamos, motors, armatures, magnetos, batteries, etc. Directors: C. Harrison and Mrs. Margaret L. Harrison, both of 50, Merrylee Park Avenue Giffnock, Renfrewshire. Registered office: 170, Hope Street, Glasgow, C.2.

Lancashire Refrigeration (Blackpool), Ltd.—Private company. Registered January 17th. Capital, £1,000. Objects: To carry on the business of manufacturers and repairers of, and dealers in, refrigerators, cold storage plant and accessories, electrical appliances, etc. Directors: G. F. Luckman, Overdale, Middleton Road, Crumpsall, Manchester, and Harry Buswell, 35, Falkland Avenue, Rochdale.

W. F. Murray, Ltd.—Private company. Registered in Edinburgh January 12th. Capital, £1,000. Objects: To carry on the business of an electrical and mechanical engineering company, etc. Directors: W. F. Murray and Mrs. Jessie H. Murray, both of 6, Laidlaw Terrace, Hawick. Registered office: 10, Baker Street, Hawick.

Radio and Battery Service Co., Ltd.—Private company. Registered in Belfast December 28th. Capital, £2,000. Objects: To acquire the business of a radio and battery service engineer and dealer now carried on by W. M. H. B. Allan at 32, Fountain Street, Belfast, as "The Radio and Battery Service Co." Directors: W. M. H. B. Allan, Woodgreen, Shankbridge, Co. Antrim, and C. L. Dean, 410, Oldpark Road, Belfast. Registered office: 32, Fountain Street, Belfast.

Aldertons of Edgware, Ltd.—Private company Registered January 29th. Capital, £3,000. Objects: To acquire the business of a radio and television engineer and dealer carried on by C. A. Alderton (trading as Aldertons), 4, Bank Parade, Edgware, Middlesex. Directors: C. A. Alderton and Bessie A. Cox, both of Glenalmond, Canons Drive, Edgware, Middlesex. Registered office: 4, Bank Parade, Edgware, Middlesex.

Adalco, Ltd.—Private company. Registered January 25th. Capital, £10,000. Objects: To carry on the business of manufacturers of, and dealers in, electric fires, cookers and boiling rings, etc. Directors: M. Finegold, 7, Princes Street, Hanover Square, W.1, and Mrs. Minnie Finegold, 119, Ashford Court, N.W.2.

Mortgages and Charges

Brandon Electrical Engineering Co. (Leeds), Ltd.—Mortgage on Pottery Fields Sunday School, Leeds, dated December 31st, 1945, for securing £2,000 originally advanced and any re-advances by the mortgagee of sums repaid by the mortgagor. Holders: Provincial Building Society, Leeds.

J. & J. Couch, Ltd.—Mortgage on 21, Chapel Street, St. Ives, dated December 31st, 1945, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

P. M. Distributors, Ltd.—Satisfaction in full on July 4th, 1940, of debentures dated October 14th and registered October 20th, 1937. (Notice filed January 22nd, 1946.)

Bankruptcies

H. K. Hawkins, electrical engineer, lately residing at 48, Beaufort Road, Edgbaston, Birmingham.—Application for discharge to be heard March 12th at the Court House, Corporation Street, Birmingham.

STOCKS AND SHARES

STOCK Exchange markets present a firm front in which gilt-edged securities, led by those in the British Government list, play a prominent part. The Home Railway companies will shortly declare their dividends in respect of 1945, and this has attracted languid attention to the market, making prices a little better on balance. Investment remains insatiable as ever for front-rank ordinary shares. The new issue of Lancashire Electric 3¾ per cent. preference at 20s. aroused notice on account of the comparatively high price asked for the shares, and the fact that this is the first issue of its type made since the outbreak of war. The turnover of stocks and shares in the Stock Exchange markets every business day, continues to be of substantial extent. Having regard to the general conditions, prices remain remarkably good.

The Investment Bill

The Control of Investment Bill will, if passed, perpetuate most of the wartime controls and restrictions on capital issues and investment. While recognising the present need for directing the flow of capital, the City complains chiefly about the interference with its own efficient machinery for the marketing of securities, and about the failure of the Bill to recognise the difference between new and existing investment. The Capital Issues Committee will remain, under the direction of the Treasury, to deal with applications for raising money.

Lancashire Electric New

On Monday in this week the subscription list opened and closed in respect of 1,000,000 Lancashire Electric cumulative preference shares of £1 each, carrying dividends of 3¾ per cent., and offered at par, 20s.; dividends payable on June 30th and December 31st. This is the more interesting from being the first issue of capital required, as new money, for development of a utility company. Shareholders in the company were offered preferential consideration in the allotment. The price of 20s. for a 3¾ per cent. preference share is certainly high. In this case, the security is exceedingly strong and, in addition, the fact of the shares coming out at par, 20s., should save holders from likelihood of loss under nationalisation. It is, of course, impossible to dogmatise at present on this point, but the sponsors of the new Lancashire Electric issue no doubt have little fear as to what is likely to happen to these shares.

London Associated Electric

This company paid regular dividends of 7 per cent before the war. The distributions for 1943 and 1944 were down to 4 per cent. A line of the £1 shares is on offer at 27s., to yield barely 3 per cent. on that basis. This compares with returns of nearer 4½ per cent. on most of the Provincial undertakings, and reflects the expectation that earnings will before long allow distribution to be restored to somewhere near the pre-war level. To put the yield on a par with others in the market for electricity supply shares, the dividend would need to be 6 per cent., giving a return of £4 9s. at the offered price. The declaration is due in March.

Scophony

Scophony, Ltd., was incorporated for the purpose of acquiring the assets of a private company formed in 1930 to develop the Scophony system of television. The company is engaged in research and development towards extending the range of television transmission; of methods of making television available in conjunction with the telephone, and, generally, on the application of television to industry. The company's patents cover a wide range in television. The issued capital is £210,025, of which £25 is in 100 "A" shares of 5s. each, the remainder being in ordinary shares, also of 5s. No dividends have yet been paid. The recent demand from America, which caused a spectacular rise from 9s. to 14s. 9d., took everyone on this side by surprise.

Atlas Electric

As a minor feature in our price lists, Atlas Electric stand out with a rise to 11s. bid. In the market the old rumour was resuscitated of the Montevideo Tramways being taken over by the municipality at the price of £1½ million. The report met with no more credence than most of its predecessors have done, but it has served its turn in putting up the price of the shares.

Engineering and Lighting Equipment

Preference shareholders in Engineering & Lighting Equipment have an unusual offer to consider. As matters now stand, the 7 per cent. cumulative preference shares are finally redeemable at 25s. in 1954, or earlier on three months' notice. Compulsory allotments to the redemption fund stand in the way of a larger distribution on the ordinary capital. It is suggested to shareholders that they might prefer to have the life of their investment extended on a 7 per cent. basis rather than ended in, at the most, eight years' time.

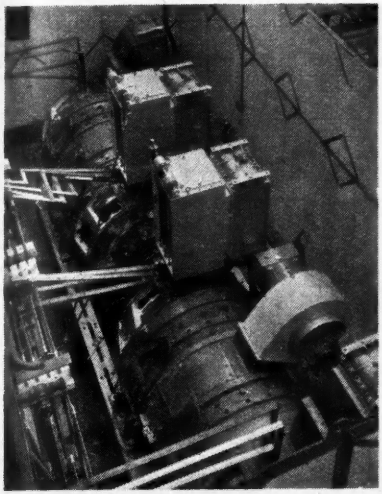
The proposal is, therefore, that the scale of appropriations to the redemption fund should be decided annually by the directors, subject to the shareholders' approval, rather than by the present compulsory provisions. While ordinary shareholders will have no doubt about the benefits, holders of the preference may wonder whether it suits their individual requirements. They will probably call for more light on the company's powers over redemption in the event of the scheme being carried. The 2s. ordinary shares are changing hands at around 3s. 6d., and the preference at 23s. 9d.

Manufacturers' Activities—II

Noteworthy Developments in 1945

Bruce Peebles & Co., Ltd.

LAST year orders for large numbers of motors for virtually every kind of industry were accepted by Bruce Peebles & Co., Ltd. Coal mining provided a heavy demand for flame-proof



These Bruce Peebles submarine motors are 625-HP 190-V 290-RPM tandem closed-air-circuit water-cooled reversible DC machines, shown in a test house constructed and heated to reproduce working conditions

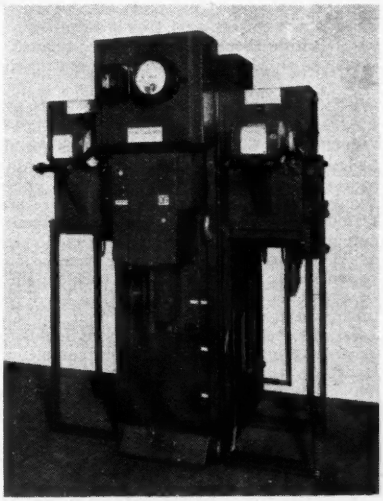
machines for coal-face loaders, conveyors, haulages and pumps. The considerable demand for small alternators experienced in the previous year, particularly those to be coupled to internal-combustion engines and to geared turbines was well sustained.

The transformer shop has been extended to make further provision for research and to meet advances in technique as well as to cope with the large number of orders in hand for transformers ranging in capacity from small pole-type units of a few kVA to those of several thousand kVA and voltages up to 132 kV. Those for collieries include mobile substations with flame-proof switchgear. An example of the larger kind is a 15,000-kVA 33/6·6-kV unit with in-phase and quadrature booster for phase-angle control. A number of mercury-arc rectifiers are under construction for public supply authorities and industrial concerns. For charging car batteries underground, a one-piece unit comprising a low-height transformer and metal rectifier in a common tank with flame-proof control gear has been developed. Orders for India include four 1,500-kW motor-converters, a 1,000-kW rotary convertor, two 10,000-kVA transformers, distribution transformers and motors. Two 12,500-kVA transformers are being built for Canada, which along with New Zealand and Australia, calls for a number of the products of the company in their various categories.

Reyrolle & Co., Ltd.

PROBABLY the most notable event in last year's operations of Reyrolle & Co., Ltd., was the commissioning of 110-kV air-blast switchgear and the completion of 132-kV breakers of the same type (*Electrical Review*, November 9th); a large order is now in hand for 66-kV 2,000-MVA switchgear for a power station. New 132-kV isolators are being manufactured. Horizontal draw-out metalclad units, redesigned in detail, are available in a short-circuit-tested range extending from 25 MVA at 3·3 kV to 1,000 MVA at 33 kV; arc control devices in breakers of 150 MVA and upwards, with a double break, have led to a reduction in oil content.

A new range of 150-MVA 6·6 and 11-kV distribution switchgear with arc-control devices and having air-insulated or compound-filled busbars has been produced; because of the



An 11-kV 150-MVA Reyrolle circuit-breaker panel with two isolators, forming a ring-main tee-off unit

vertical isolation adopted it occupies less space than the horizontal draw-out type.

Established types of switchgear from 0·4 to 33 kV and from 5 to 750 MVA and isolators and fuse-switches up to 11 kV have continued in steady demand. Production of a new design of 400-V 25-MVA air-break circuit-breaker has begun. Increase in system short-circuit values is illustrated by the replacement of 500-MVA 33-kV circuit-breakers in a power station by units of 750 MVA. Several sets of control equipment have been supplied for electric ship propulsion.

Contracts for the U.S.S.R. have been almost completed, including the entire switchgear for a large power station, while large quantities of protective gear have been supplied for other stations; there has also been a demand for feeder protection for 121-kV lines in that country. Switch-fuse gear for service overseas is still being taken by the Admiralty. Oil refineries have been supplied with switchgear for all standard voltages up to 11 kV (500 MVA). There has been a steady demand from Australia for 66-kV 500-MVA small-oil-volume breakers. Power station equipments have been made for 33 kV and 1,500 MVA for South Africa and Southern Rhodesia.

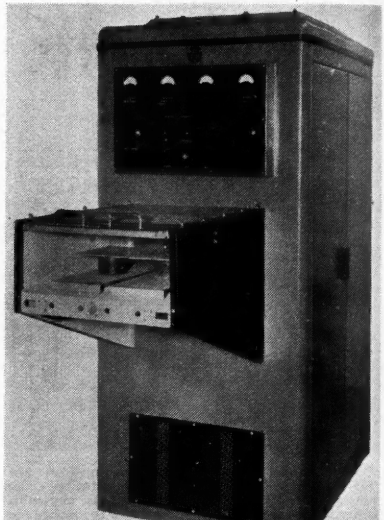
For mining, the output increased to a new level, particularly of lower-voltage gate-end switchgear for all in-bye purposes and including large sequence-interlocked power loading schemes. Substantial orders have recently been received for electric drives for newspaper presses and the volume of business in AC variable-speed commutator motors has been heavier than ever. Production of battery-vehicle DC motors and auxiliary equipment in considerable quantities was begun.

British Thomson-Houston Co., Ltd.

WORK undertaken or in progress at the B.T.H. works last year included a number of large turbo-alternators running at 3,000 RPM. Representative examples are two of 53,000 kW (75,000 kVA) with 34·6-kV alternators for the Lancs. E. P. Co., one of 53,000 kW for Nottingham and six of 30,000 kW for other undertakings. Among the export orders are three 13,700-kW sets and several others of smaller outputs. In addition a number of extraction sets of 25,000 and 12,000 kW and transportable geared sets (of which fifty have been supplied) were built for the U.S.S.R. The first lot of sets similar to the last named, rated at 550 and 2,500 kW, ordered by the Ministry of Supply for its relief programme, are nearing completion. Hydro-electric plant on the stocks includes three impulse-turbines driving 9,800-kVA 600-RPM alternators; these are for the Ceylon Government scheme, in connection with which fourteen 5,000-kVA 11/66-kV transformers, switchgear for both voltages and an 8,000-kVA synchronous condenser are also called for.

Two sets of 13,000-SHP turbo-electric propelling machinery were ordered, one a duplicate of that supplied to the *Rangatira* in 1921 for New Zealand and the other similar to two previously made for a 17,000-ton tanker. In another instance four Diesel-alternators will supply a single propeller motor and certain AC auxiliaries.

Development work is in hand on gas turbines of from 1,000 to 10,000 HP, the heat consumption of which is expected to be comparable with that of steam turbines. A promising field lies in the electric propulsion of ships, since reversing would not call for the use of an astern turbine, and in situations where coal and water are less readily obtainable than oil or gaseous fuels.



B.T.H. radio-frequency dielectric-heating equipment with automatically operated enclosed work electrodes

Six 1,500-MVA 132-kV "Aerojet" circuit breakers for indoor mounting are nearing completion. Other air-blast switchgear on order includes 800- and 300-A 6·6-kV "Aeroblast" breakers rated at 350 MVA in cellular switchgear. Resistance switching is being applied to oil breakers of 1,500 MVA at 132 kV and 2,500 MVA at 110 kV. Breakers of all kinds can be tested up to 2,500 MVA at 132 kV. A number of orders have been executed for a new convector-type earthing resistor, which is built up of multiple liquid resistance tubes coupled to top and bottom reservoirs interconnected to permit free circulation of the electrolyte; ratings up to 800 A at 33 kV for 30 sec. are obtainable from one resistor frame. For complying with the revised coal mining regulations flame-proof switchgear, which isolates the socket contacts from both circuit and busbars, and earth-fault

protective devices for air-break switchgear are being made.

Large transformers in hand include a 60,000-kVA 15/132-kV unit for Nottingham and a 13,750-kVA unit for Torquay—both for direct connection to B.T.H. alternators. For installation in India there are eleven transformers of from 4,000 to 25,000 kVA under construction. Transformers completed include one of 60,000 kVA, 132/33 kV, for the C.E.B. substation at Hams Hall " B " and another of 15,000 kVA, 66/33/11 kV, for the Derby & Notts Co. and three of 5,000 kVA, 11/66 kV, for India. Forced-cooled cast-in-concrete reactors are now being manufactured. Five banks of regulating transformers, each of 75,000 kVA at 33 kV and made up of single-phase units are on order for the Lancs. E. P. Co.

Included among several orders received for synchronous condensers is one from the New Zealand Government for five 30,000-kVA 11-kV sets and another from India for two 5,000-kVA 11-kV sets.

A 2,760-HP (6,900-HP peak) twin-motor winder with Amplidyne field control of the synchronous-induction motor of the Ward-Leonard set has been ordered for South Africa. For the same Dominion is a winder driven by two 6·6-kV geared induction motors each of 1,400 HP (6,000 HP peak). The many equipments for DC rolling mills include a 1,400-HP (4,200 peak) 45-90-RPM reversing cogging mill, a 1,500-HP 600-V motor for a four-stand tandem cold strip mill with tapered-tension control and 750- and 225-HP motors for a skin-pass mill and a 2,200-HP heavy-tube mill. Further orders have also been received for variable-speed AC commutator motors for strip mills and non-ferrous mills with direct-on starting and push-button control. Paper and rubber and textile mills are also among the heavy drives for which electrical equipment at present is going through the shops.

In the field of electronics, development continues in connection with 20-megacycle and 500,000-cycle heating, in the control of welding and in the equivalent of W.L. control of motors up to 2½ HP. For lighting, a bigger demand than ever is reported for lamps and fittings particularly the 80-W Mazda fluorescent lamp.

NEW BOOKS

The British Gas Industry : Present and Future. By Joan Mitchell. Pp. 32. Fabian Publications, Ltd., 11, Dartmouth Street, London, S.W.1. Price 1s.

This study of the gas industry, with suggestions for its reorganisation, follows similar Fabian Society reports on the electricity and coal industries. Its appearance soon after the publication of the Heyworth Committee's report rather detracts from its value. Although, like the Heyworth Committee, this monograph recommends the setting up of regional boards (with district committees), it goes further than the Committee was prepared to go in suggesting a central gas board to take full responsibility for the administration of the industry.—J.H.C.

Phenolic Plastics. By A. T. Birkby. Pp. 91 ; figs. 32 and 14 plates. Birkbys, Ltd., Liversedge, Yorks. Price 12s. 6d., including postage.

This handsomely produced book in leather cover surveys in general terms the group of plastics with which it is concerned. Too much of what is written about this subject continues to be fantastic ; some of it is quite inaccurate, so the maker of " Elo " products and his staff have compiled this book as an endeavour to present facts in non-technical language. They describe works practice rather than technicalities, or scientific aspects, believing that to be the best way of making their story most informative to the lay mind.

Resins and powders are first dealt with, then the design and manufacture of moulds, the press shop and its equipment, methods and means of moulding and finishing; the uses of phenolics, mouldings and otherwise, are outlined as well as the need for product-control by organised inspection; production planning and works costing are among other matters considered in the book.

The author does not claim to cover the whole plastics field, but he briefly surveys the principal groups (other than phenolics) in a final " miscellaneous " chapter. The compilers of this volume have long experience of the particular group of substances with which they deal ; they write about procedure and methods they have successfully used under actual working conditions.—W.O.F.

Raw Materials from the Sea. By E. F. Armstrong and L. M. Miall; 164 pages; 21 plates. Constructive Publications, Ltd., 152, Upper New Walk, Leicester. 15s.

In this work the present stage of progress in extracting chemical products from the sea is briefly summarised. Those desiring more detailed information will no doubt find helpful the numerous references given in the text to specialist sources. The chapter of greatest potential interest electrically is that dealing with magnesium, which, owing to its light weight and strength, has come to the fore in relation to the aircraft industry during the war. As the extraction of magnesium from the sea was first started as late as 1941, little information has yet been released on the subject. Large amounts of power are needed for the purpose, but the electrical aspects are not discussed in the present book.—C.O.B.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *may be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

AKT. Ges. für Technische Studien.—" Rotors for rotary machines, particularly steam or gas turbines." 2714/44. February 12th, 1943. (574752.) " Air heaters." 7995/44. May 3rd, 1943. (574666.)

H. Allday & Son (1922), Ltd., and R. Bain.—" Cylindrical carriers for helically coiled inductance or resistance wires, or for other analogous purposes." 2166. February 5th, 1944. (574660.)

Aktiebolaget Ljungstroms Angturbin.—"Turbine blades." 2856/44. January 16th, 1943. (574759.)

C. Arnold (Therma Electric Heating Manufacturing Co., Ltd.).—" Manufacture of an improved electric resistance heating element." 2814. February 15th, 1944. (574755.)

N. Ashton and Metropolitan-Vickers Electrical Co., Ltd.—" Alternating current electric transformers." 2925. February 16th, 1944. (574778.)

Bendix Aviation Corporation.—" Electrical starting and ignition systems for internal-combustion engines." 3000/44. January 22nd, 1943. (574783.)

Blackstone & Co., Ltd., and G. Hallewell.—" Dynamo-electric machinery and prime movers therefor." 2893. February 16th, 1944. (574762.)

A. D. Blumlein.—" Hollow electrical resonators and discharge devices embodying such resonators." 14490. September 23rd, 1940. (574708.)

R. C. Braithwaite and Metropolitan-Vickers Electrical Co., Ltd.—" Low friction bearing or pivots for use in connecting links of philosophical electrical or other precision instruments." 9376. May 28th, 1940. (574706.)

British Thomson-Houston Co., Ltd., D. F. Welch and A. Grieve.—" High-frequency electrical ignition systems." 12612. September 7th, 1942. (574775.)

British Thomson-Houston Co., Ltd., K. J. R. Wilkinson and T. H. Scott.—" Core excitation of electrical transformers." 10121. July 20th, 1942. (574768.)

E. P. Divi.—" Manufacture of stators for dynamo-electric machines." 19403. November 19th, 1943. (574695.)

English Electric Co., Ltd., and P. L. Mardis.—" Speed governor and engine driven electric generating plant incorporating this governor." 19630. November 24th, 1943. (574696.)

Evershed & Vignoles, Ltd., and J. C. Needham.—" Electrical control apparatus." 18869. November 12th, 1943. (574693.)

Frigidaire, Ltd., and W. O. Kennington.—" Method of mounting needle valves." 16860. October 14th, 1943. (574691.)

Hazeltine Corporation.—" Phase modulation system for carrier wave transmitters and the like." 35343. March 3rd, 1942. (574647.) " Wave-signal direction finder." 69933. May 23rd, 1942. (574651.)

Igranic Electric Co., Ltd., and S. R. Wright.—" Means responsive to pressure differences in hydraulic or pneumatic systems." 2815. February 15th, 1944. (574576.)

J. D. Julien.—" Blades of turbines and other machines." 10832. August 3rd, 1942. (574770.)

O. K. Kolb.—" Recording of sound." 2873. February 16th, 1944. (574760.)

Archibald Low Electrics, Ltd., and D. W. Low.—" Electric water heater." 3115. February 18th, 1944. (574788.)

Mallory Metallurgical Products, Ltd.—"Electrical contacts and method of making the same." 2144/44. February 5th, 1943. (574699.)

Marconi's Wireless Telegraph Co., Ltd.—" Radio communication system." 15380/41. November 29th, 1940. (574674.)

Marconi's Wireless Telegraph Co., Ltd., and N. H. Clough.—" Cathode-ray-tube indicating apparatus, particularly for radio direction finders and the like." 15345. October 16th, 1940. (574710.)

M. O. Valve Co., Ltd., and L. Tremlett.—" Metal-to-glass seals." 2742. February 14th, 1944. (574731.)

Pritchett & Gold & E.P.S. Co., Ltd., E. M. O. Honey and C. R. Hardy.—" Production of micro-porous material." 1931. February 2nd, 1944. (574659.)

G. R. Shepherd (Westinghouse Electric International Co.).—" Electric overload circuit breakers." 1838. February 1st, 1944. (574658.)

W. Siegfried.—" Turbines." 3097. February 18th, 1944. (574787.)

Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington.—"Incandescent electric lamps." 38. January 3rd, 1944. (574719.)

Standard Telephones & Cables, Ltd.—"Electronic voltmeters and ohmmeters." 7409/44. April 24th, 1943. (574665.) " Apparatus for determining the direction of reflecting objects by means of electromagnetic waves." 2993/42. March 8th, 1941. (574675.) " Arrangements for locating objects by electromagnetic waves." 5720/42. March 13th, 1941. (574676.)

Standard Telephones & Cables, Ltd., and W. T. Gibson.—" Cooling arrangements for electron discharge devices." 2824. February 15th, 1944. (574758.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—" Frequency modulating system." 2542. February 11th, 1944. (574686.)

Tenaplas, Ltd., and C. G. Lemon.—" Electrical conductors." 2775. February 15th, 1944. (574753.)

Western Electric Co., Inc.—" Apparatus for making acoustic measurements." 2559/44. July 25th, 1942. (574726.) " Apparatus for evaluating the acoustic quality of an enclosure." 2560/44. November 17th, 1942. (574749.)

E. L. C. White and F. C. Williams.—"Circuit arrangements for the generation of electrical pulses." 10600. July 29th, 1942. (574769.)

Wright & Weaire, Ltd., and E. S. Buckley.—" Closures for the containers of electrical vibrators and interrupters." 2069. February 17th, 1944. (574780.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Aberdare.—February 18th. Electricity and Transport Department. 3-kV switchgear. (January 25th.)

Ashton-under-Lyne.—February 25th. Sewage Purification Committee. Electrical wiring, lighting, heating and power at the Corporation sewage works. (February 1st.)

Bedford.—February 28th. Electricity Department. H.v. and l.v. cables for twelve months. (See this issue.)

Belfast.—February 22nd. Electricity Department. Electrical stores and materials. (February 1st.)

Bexley.—February 11th. Electricity Department. Paper-insulated underground cables. (January 25th.)

Birkenhead.—February 18th. Electricity Department. Supply of electric lamps for twelve months. (January 25th.)

Cheadle & Gatley.—February 11th. Electricity Department. Cables, lamps and meters. (January 25th.)

Erith.—February 28th. Electricity Department. Electrical materials for twelve months. (February 1st.)

Hastings.—February 19th. Electricity Department. Cable laying. (February 1st.)

India.—DELHI.—March 15th. Delhi Central Electric Power Authority. Switchgear and transformers. (January 25th.)

Kensington.—February 12th. Borough Council. Electrical goods (cables, flexibles, tapes, conduits, fittings and accessories), for twelve months. Particulars from the town clerk. Town Hall, W.8.

Kettering.—February 23rd. Electricity Department. Supply, delivery and erection of cast-iron pipes and headers to recondition two economisers. (January 25th.)

Littleborough.—February 28th. Electricity Department. Underground cables and sub-station equipment. (See this issue.)

Norwich.—February 12th. Electricity Department. Ripple control equipment. (Jan. 25th.)

Sale.—Corporation. Supply and delivery of cable and eight 500-kVA transformers. (See this issue.)

Skelton & Brotton.—February 19th. Electricity Department. Washboilers, cookers, lighting columns and lanterns. (January 25th.)

Southampton.—February 15th. Electricity Department. Electric meters for twelve months. (February 1st.)

Southend-on-Sea.—February 28th. Electricity Department. Electrode boiler plant, etc., for the Hot Sea Baths Establishment. (January 25th.)

Southwark.—February 16th. Electricity Department. Pipework for circulating water mains between cooling towers, circulating pump and condenser of a steam turbo-generator. (February 1st.)

Sunderland.—February 11th. Council. Electrical installations on the Springwell Farm estate. (January 25th.)

Wandsworth.—February 13th. Borough Council. Electric lamps for twelve months from March 31st. Particulars from the town clerk, Municipal Buildings, S.W.18.

Worcester.—February 26th. Electricity Department. Cables, conductors, transformers, meters and joint boxes for twelve months. (February 1st.)

Orders Placed

Darlington.—Corporation. Accepted. Electrical work in houses, Coleridge Gardens (£1,142).—W. E. Dove.

Manchester.—Transport Committee. Accepted. Cable. W. T. Glover & Co; Wholesale Fittings Co.; L. Andrew & Co.; and British Insulated Callender's Cables.

St. Pancras.—Contracts Committee. Recommended. Amplifying equipment at Assembly Hall (£212).—Standard Telephones & Cables. Economiser renewals (£2,107).—Babcock & Wilcox. 50-gal. water heaters (£51).—G.E.C. Fluorescent fittings (£246).—B.T.H. Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ammanford.—Houses (50), Bettws, for U.D.C.; G. H. Davies, architect, College Street.

Barnet.—Houses (186), and twelve flats on estate between Mays Lane, Chesterfield Road and Whitings Road (£220,000); E. E. Scott, surveyor.

Bermondsey.—Rebuilding flats, Dickens estate (£10,624); M. J. Gleeson, Ltd.

Billingham-on-Tees.—Electric lighting and heating in place of gas in 400 U.D.C. houses; J. J. Hill, surveyor, U.D.C. Offices.

Birmingham. — Factories :— Spring Hill; Boucher-Giles, Ltd., dairy engineers, 73, Great Hampton Street. Western Road; Stevens & Bullivant, engineers. Adderley Street; United Wire Works, Ltd.

Bridgwater.—Factory, Bristol Road; A. G. Gill & Co., London.

Chepstow.—Permanent houses (42), for U.D.C.; A. Gill, clerk, Gate House.

Chorley.—Houses (61), Moor Road estate; L. Bailey, clerk, East Pallant House.

Clapham.—Rebuilding flats, Poynders Gardens (£7,880); H. Fairweather & Co.

Coatbridge.—Foundry, with electric furnace; R. B. Tennent, Ltd.

Darfield.—Houses (48); U.D.C. surveyor.

Dearham (Cumberland).—Houses (40), for the North-Eastern Housing Association; T. Jackson, builder, Keswick.

Dunbar.—Houses (120); burgh surveyor.

Dunstable.—Houses (30), Beecroft estate; R. R. Hole, borough surveyor, Municipal Offices.

Durham.—Coal distillation plants, Horden and Spennymoor; British Coal Utilisation, Ltd., London.

Enfield.—Houses (48), Holmesdale estate; W. M. Edwards.

Eston.—Houses (22), Grangetown estate; Hudson Bros. (Middlesbrough), Ltd.

Fulham. — Tenements, Fulham Road (£108,145); borough engineer.

Galashiels.—Houses (78); burgh surveyor.

Grange Hill (Essex).—Estate development (£1,315,000); L.C.C. architect.

Grimsby.—Houses (51), Nunsthorpe; J. V. Oldfield, borough engineer, Municipal Offices, Town Hall Square.

Hampstead. — Dwellings, Garnet Road (£14,516); borough engineer.

Henley-on-Thames.—Houses (45), for R.D.C.; T. L. Easby, clerk, 12, Hart Street.

Hereford.—Flats (48) and houses (20), Whitecross; C. E. T. Booth, architect.

Hetton.—Houses (50), Low Moorsley; Fennell & Co., architects, Bridge End Chambers, Chester-le-Street.

Ickenham.—Primary school, Manor Homes estate; Middlesex county architect.

Islington.—Tenements, Liverpool Road (£76,943); Gee, Walker & Slater, Ltd.

Kidderminster.—Houses (50), on three sites, for R.D.C.; A. S. Northover, surveyor, Land Oak House.

Lambeth.—Rebuilding flats, Cowley estate (£8,129); Wilson, Lovatt & Sons, Ltd.

Tenements, Front Street (£89,861); borough engineer.

Lancashire.—Houses for police and other employees (£254,000); county architect, Preston.

Lichfield.—Houses (100), Stowe Street estate; city surveyor, Guildhall.

Llandilo.—Houses (28), Llandebie (£29,658), for R.D.C.; Lewis Davies & Sons, builders, Wellfield Yard, Penygroes.

Llandudno.—Permanent houses (36), Cwm Place; J. A. Edwards, surveyor, Town Hall.

Longsight.—Factory extensions, Nuthurst Vale and Lime Bank Street, for Lloyds Packing Warehouses, Ltd.; W. Gornall & Sons, builders, Gore Street, Salford, 3.

Manchester.—Law Courts (£1,885,000); Lancashire county architect, Preston.

Melford.—Permanent houses (68), Long Melford and Glemsford, for R.D.C.; P. Bicknell, architect, 1, Tunwell's Court, Trumpington Street, Cambridge.

Morpeth.—Electric lighting and wiring of 30 houses at Stobhill Gates; F. K. Perkins, borough engineer.

Nottingham.—Permanent houses (605), on the Aspley Lane, Bestwood & Arnold, and Broxtoe estates (£507,845); R. M. Finch, city engineer.

Penketh.—Modern school (£18,683); Lancashire county architect, Preston.

Richmond (Surrey).—Houses (32), Murray Road, Ham; borough engineer, Hotham House, Heron Court.

Rochester.—Houses (100), Watling Street; Stoner & Sons, architects, 69, Lincoln's Inn Fields, London, W.C.2.

Shildon (Co. Durham).—Factory for Alfred Morris, Ltd., London; J. S. Bramwell, Newstead Street, Sherwood, Nottingham.

South Molton.—Houses (24), Station Road; borough surveyor, Municipal Buildings.

Stamford.—Houses (50), Drift Road; F. J. Lenton, architect, 16, Broad Street.

Stockton-on-Tees. — Factory, Commercial Street; Kennedy & Co., Vulcan Street, Middlesbrough.

Walton-le-Dale.—Conversion isolation hospital to children's home; Lancashire county architect, Preston.

Wandsworth.—Tenements, Clapham Park estate (£35,756); Gee, Walker & Slater, Ltd.

West Riding.—Completion of two modern schools, Mytholmroyd and Queensbury; county architect, County Hall, Wakefield.

Whitby.—Houses (38); R.D.C. surveyor.

Widnes.—Junior school, Dykin Road; Lancashire county architect, Preston.

Wigston.—Permanent houses (112), Clarkes Road, Central Avenue estate; Picke, Everard, Keay & Gimson, architects, 6, Millstone Lane, Leicester.

Woolston.—Senior school, Holes Lane; Lancashire county architect, Preston.

Worsley.—Houses (86), Engine Fold and Hilton Lane sites, Little Hulton; G. & J. Seddon, builders, Manchester Road West, Little Hulton, near Bolton.

York. — Permanent houses (100 costing £110,000); city architect.

Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references :—

Palestine.—A Tel Aviv firm wishes to import domestic and industrial fans, mica sheets, laminated plastic sheets, installation accessories, small electric motors and electrical instruments. (X.144.)

Turkey.—Istanbul firm of importers and distributors of industrial and engineering supplies wishes to get into touch with British electrical manufacturers. (X.145.)

Iraq.—Mosul agent seeks connections with first-class manufacturers of all kinds of electrical goods, equipment and accessories. (X.146.)